EDIBLE AND POISONOUS MUSHROOMS

A DESCRIPTIVE HANDBOOK TO ACCOMPANY THE AUTHOR'S COLORED CHART OF EDIBLE AND POISONOUS MUSHROOMS

BY

WILLIAM ALPHONSO MURRILL, A.M., PH.D.

ASSISTANT DIRECTOR OF THE NEW YORK BOTANICAL GARDEN, ASSOCIATE EDITOR OF NORTH AMERICAN FLORA, EDITOR OF MYCOLOGIA

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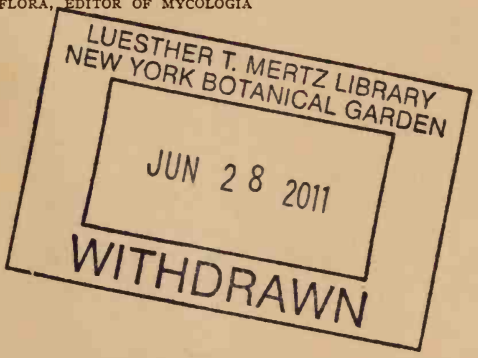

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EDIBLE AND POISONOUS MUSHROOMS

INTRODUCTION

Edible Mushrooms*

The popular and widespread interest in mushrooms of all kinds is almost phenomenal. This is due to their beauty of form and color and the supposed mystery surrounding their origin and growth, as well as to the use of certain kinds for food. Their nutritive value is not great, being about equal to that of cabbage, but they afford variety in flavor and add greatly to the relish for other foods.

Mushroom eating is much more common in Europe than in this country. The struggle for existence is greater there, and the edible and poisonous varieties are better known by all classes of people. In China, it is almost impossible for a botanist to get specimens on account of the thorough manner in which all wild food is collected by the natives.

The use of mushrooms in this country is as yet very limited, being confined chiefly to our foreign-born population. Even in New York City, many excellent kinds go to waste every season because they are different from kinds known in Europe. This is especially true of the puffballs, which do not seem to be gen-

*Attention is called to Wood's Reference Handbook of the Medical Sciences, Ed. 2. 4: 574–596, plates 34 and 35, with 22 colored figures, and text figures 2654–2679. 1914. This valuable work should be found in any good reference library.

erally recognized as edible. On the other hand, many doubtful species are collected in a wholesale and indiscriminate manner by ignorant foreigners, who, while searching the lawns for the common mushroom and the stumps for the beefsteak mushroom and the honey agaric, appear to gather everything they find at all resembling edible forms known to them.

All knowledge regarding the edible and poisonous properties of mushrooms is based on experiments, either intentional or unintentional. The only safe rule is to confine oneself to known edible forms until others are proven harmless. If one is a beginner, he is like an explorer in a new country with an abundance of attractive fruit near at hand, which may be good or may be rank poison; he cannot tell without trying it, unless some native, who has learned from his own and others' experience, shares his knowledge with him.

The writer on this subject undertakes a very responsible task, owing to the vast number of similar forms among the mushrooms which are distinguished with difficulty by those not accustomed to fine distinctions; but it should be possible with the aid of colored figures to describe a few striking kinds in such a way that no serious mistakes will be made.

The common field mushroom is known to almost every one who pretends to collect mushrooms at all, and the majority of collectors limit themselves entirely to this one kind. It grows in low grass on meadows or on rich, moist, upland pastures, being common after rains from August to October. The upper side is white with brownish fibrils or scales, and the under side is a beautiful salmon-pink when young, changing gradually to almost black when old. The stem is colored like the top and has a loose white ring around it. There is little or no swelling at the base of the stem and no "cup," as in the deadly amanita, which

latter, moreover, is white underneath and grows usually in woods or groves.

The "spawn," or vegetative portion of the common mushroom, is hidden in the soil and feeds upon the dead organic matter found therein. When the proper season arrives, small fruit bodies, known as "buttons," appear on the spawn and soon develop into "mushrooms," which are in reality only the mature fruit bodies of a delicate and widely branching plant entirely concealed in the earth. The parts of the fruit body are popularly known as the "stem" and the "cap." On the under side of the cap are the "gills," which bear countless tiny bodies known as "spores," which are distributed by the wind and produce new plants as seeds do in the case of the flowering plants. The cottony "ring" on the stem is what remains of a thin white "veil" which covered the gills in the younger stages of growth. This veil is not present in all kinds of mushrooms.

In the cultivation of the common mushroom, bricks of spawn are planted in suitable soil and the conditions of growth attended to with great care. Any one wishing to grow mushrooms should provide himself with a good handbook on the subject, or learn the secret from a practical man in the business. It is not easy to do successfully unless done properly.

I have frequently noticed a tendency in ignorant or inexperienced persons to belittle the dangers of mushroom eating, apparently believing that a show of bravado or fearlessness will overcome the effects of the poisonous kinds, as though they belonged to the category of myths or ghosts. It is, indeed, true that many varieties have been called poisonous when they were not, just as most of our snakes have been under the ban on account of the mischief done by three or four; but there are a few mushrooms that contain poisons just as deadly as that of

the rattlesnake or copperhead, and these are responsible for practically all of the deaths due to mushroom eating. These poisons are narcotic rather than irritant, and their effects are usually slow to appear.

If distress is experienced within four or five hours after eating mushrooms, it is very probably a case of indigestion or minor poisoning and should readily yield to a prompt emetic. If, however, from eight to twelve hours have elapsed since eating the mushrooms, disagreeable symptoms should be taken very seriously, since it is almost certain that one of the deadly poisons is at work. A physician should at once be called and the heart action stimulated by a hypodermic injection of about one-sixtieth of a grain of atropine, which should be repeated twice at half-hour intervals. Atropine is an antidote to the poison of the "fly amanita," which paralyzes the nerves controlling the action of the heart. If the "deadly amanita" has been eaten, the atropine will probably do no good, and death will surely follow if the amount eaten is sufficient.

The deadly amanita, shown in three of its forms in the chart; is a very conspicuous and beautiful object, occurring throughout the summer and autumn in open groves and along the edges of woods. Neither its odor nor its taste is disagreeable, as is the case with most inedible mushrooms, and it must be recognized by a careful study of its form and parts, which are, fortunately, very characteristic.

The most important part of the deadly amanita is the sheath at the base of the stem known as the "death-cup," which is well shown in the illustrations. This is what remains of the outer coat of the "egg" after the cap has burst from it and has been carried upward by the growing stem. The ring on the stem is similar to that of the common mushroom, but the gills are

white, both when young and old, those of the common mushroom being at first pink, then black. Nothing can be told from the color of the upper surface of the cap because it varies so much, being pure white, yellowish, brownish, or blackish. Sometimes the surface is perfectly smooth and at other times it is adorned with pieces of the death-cup which were carried up on it when the cap burst through the roof of the egg.

When gathering mushrooms, it is exceedingly important to get all of the stem and not leave a portion of it in the ground, since the death-cup may thus be overlooked. Mushrooms should not be gathered in the "button" stage unless mature specimens are growing in the same place, otherwise an egg of one of the poisonous kinds may be collected by mistake.

The fly amanita is as beautiful as it is dangerous. The cap is usually bright scarlet, yellowish, or orange, sometimes fading to nearly white, and covered with conspicuous warts, which are portions of the death-cup carried up from below. The rest of the cup will usually be found in fragments in the soil about the swollen base of the stem. The gills are white and remain so, thus differing from those of the common mushroom. The warts on the cap also distinguish it. I have not found this species common about New York, but it is very abundant in many localities, both in this country and in Europe.

The death-cup and its remains on the surface of the cap should always be looked for, and no mushroom of this group should be eaten by the beginner, although some of them are excellent.

My advice to beginners is to confine themselves at first to the common mushroom, the beefsteak mushroom, the puffballs, the coral mushrooms, and other readily recognizable forms, being careful to carry with them when collecting an accurate mental picture of the deadly kinds which have the death-cup or the

peculiar patches on the cap, and to avoid mushrooms that are either too young or too old when selecting specimens for the table. If one must experiment, let him begin with experiments in cooking, since the way in which a mushroom is cooked often has much to do with its flavor and digestibility.

Mushrooms for Beginners.—Common Mushroom, Morel, Chantarelle, Beefsteak, and Sulphur-colored Polypore. Shaggy-mane, Common Inkcap, and Glistening Inkcap. All Puffballs, provided they are white, tender, and homogeneous within. All Coral-fungi, if they are fresh, crisp, tender, and have neither bad odor nor bad taste. The Oyster Mushroom and its near relatives. These are large, with white gills and short stems, and grow on dead wood above ground.

Some Critical Edible Species.—Polypores that are sufficiently tender, avoiding certain Boleti and *Fomes Laricis*. Boleti that have been tested and found edible, avoiding *Suillellus luridus*, *Ceriomyces miniato-olivaceus*, and *Tylopilus felleus* in particular, or all species with red tube-mouths and bitter or peppery taste, and species that turn blue quickly when handled. Species of *Russula* and *Lactaria* with pleasant odor and flavor, avoiding such species as *L. rufa*, *L. torminosa*, *R. foetens*, and *R. emetica*. Several species of *Lepiota*, avoiding *L. Morgani*, with green spores, and species of *Venenarius*. *Marasmius oreades* must not be confused with *M. urens*, nor with *Inocybe infida*. *Clitocybe*, *Tricholoma*, and *Collybia* are usually edible; avoid *Monadelphus illudens*. *Vaginata* too closely resembles *Venenarius*.

Poisonous Mushrooms

Considering its importance and interest, it is remarkable how little is really known about the subject of poisonous mushrooms; and the statements and opinions of various authors are so con-

flicting that one often does not know what to believe regarding the commonest and best known forms. Most of the literature centers about two species, *Venenarius muscarius* and *Venenarius phalloides*, which, owing to their abundance, wide distribution, conspicuous appearance, and deadly qualities, have been the chief causes of death from mushroom eating the world over. The clinical side of the subject is an old one, but careful chemical investigation into the causes of the effects observed dates back only about two decades, being dependent upon the development of modern methods in organic chemistry.

As the use of mushrooms in this country for food becomes more general, the practical importance of this subject will be vastly increased and it may be possible to discover perfect antidotes or methods of treatment which will largely overcome the effects of deadly species. This would be a great boon even at the present time, and there will always be children and ignorant persons to rescue from the results of their mistakes. Another very interesting field, both theoretical and practical in its scope, is the use of these poisons in minute quantities as medicines, as has been done with so many of the substances extracted from poisonous species of flowering plants, and even from rattlesnakes and other animals. Thus far, only one of them, the alkaloid muscarine, has been so used.

The poisons occurring in flowering plants belong chiefly to two classes of substances, known as alkaloids and glucosides. The former are rather stable and well-known bases, such as aconitine from aconite, atropine from belladonna, nicotine from tobacco, and morphine from the poppy plant. Glucosides, on the other hand, are sugar derivatives of complex, unstable, and often unknown composition, such as the active poisons in digitalis, hellebore, wistaria, and several other plants.

The more important poisons of mushrooms also belong to two similar classes, one represented by the alkaloid muscarine, so evident in *Venenarius muscarius*, and the other by the deadly principle in *Venenarius phalloides*, which is known mainly through its effects. Besides these, there are various minor poisons usually manifesting themselves to the taste or smell, that cause local irritation and more or less derangement of the system, depending upon the health and peculiarities of the individual.

The history of mushroom poisoning dates back to Babylonia and ancient Rome, and every year since then has added to the list of victims, many of whom have been persons of importance. In some cases, poisonous species were used in committing murder. The annual number of deaths in the United States due to mistaking poisonous species for edible ones is probably a hundred, many of which are not reported.

The tests used to distinguish poisonous mushrooms have been most varied and curious, and nearly always mixed with queer traditions and superstitions. If the percentage of deadly forms were not so small, probably not over one per cent., the fatalities from this source would have undoubtedly been much more numerous. The only safe rule to follow is the one used with other plants, namely, to know each species accurately before eating it. Even the rules carefully formulated by mycologists are almost certain to prove unreliable as men grow bolder and attempt to eat species not previously tested, because everything that is known in this field has been discovered by experiment, and predictions or generalizations of any kind are both unscientific and unsafe. It may be possible to forecast accurately the discovery of a new chemical element with given properties, but mushrooms have not yet been reduced to that basis.

The Chief Poisonous Species.—Venenarius phalloides, V. muscarius, V. cothurnatus, and *V. solitarius. Clitocybe illudens. Inocybe infida. Panaeolus venenosus. Panus stypticus. Chlorophyllum molybdites. Russula* and *Lactaria*, about ten species. Rosy-spored species, a few. Several of the phalloids, probably. Several species not yet tested, doubtless.

Preparing and Cooking Mushrooms

Reject old specimens or those infected with insects, cut off the stems unless they are unusually tender, peel a few kinds that seem to require it, wash quickly in cold water, drain and keep in a cool place until ready to cook. As a rule, mushrooms cannot be kept very long in a fresh condition, and this is particularly true of certain very desirable species. When more are collected than can be used at once, it is best to boil them ten minutes, drain, keep in a cool place, and finish the cooking next day as desired. If allowed to stand in water, the flavor is impaired; also, peeling may remove some of the best flavored parts.

The flavor and digestibility of mushrooms depend very largely on the way they are cooked. Tender varieties should be cooked quickly and served at once; tough varieties require long, slow cooking. When the flavor is good, it should be retained by covering during the cooking process and seasoning in a simple way. When the flavor is poor or when the specimens are slightly bitter or otherwise objectionable in the raw state, they may often be greatly improved by boiling for a short time and throwing the water away, then cooking thoroughly and seasoning well. It is often desirable to mix a few highly flavored specimens with those lacking flavor. Mushrooms are also excellent cooked with meat, poultry, oysters, tomatoes, or sweet peppers, and as a flavoring for soups and sauces.

The most practical and successful methods of cooking mushrooms resolve themselves into broiling, baking, and stewing. In the first, which I prefer to all others, the mushrooms are cooked thoroughly but as quickly as possible on both sides over a hot fire; seasoned with pepper, salt, butter, and perhaps small bits of toasted bacon; and served hot on toast. To bake mushrooms, line the pan with toast, add the specimens, season, pour in half a cup of cream, cover closely, and bake rather slowly for fifteen minutes or more according to quality. In stewing, the mushrooms are boiled in water until thoroughly cooked, then seasoned, thickened, and served on toast. This last method is often used for the tougher or poorer varieties. Certain modifications of the above methods may be suggested later under individual species requiring special treatment.

DESCRIPTIONS OF EDIBLE AND POISONOUS MUSHROOMS

No reliable general rules can be given for distinguishing edible and poisonous fungi; each species must be known by its own characters. In addition to the scientific descriptions, many illustrations and descriptive notes are added. The order of treatment follows the lines of classification adopted by the best authorities. It is impossible to use keys in an incomplete list of this kind without being misleading; keys are possible only when all the known species of a group or of a region are included. Technical terms are defined in a brief glossary at the end of this pamphlet.

Morchella esculenta Pers. Edible. Fig. 23

COMMON MOREL ESCULENT MOREL

Pileus ovoid, three to six centimeters long and two to four centimeters thick, yellowish-brown, becoming darker with age, marked over its entire surface with broad pits separated by ridges forming a network; stipe white, granular, about as long as the pileus, but only half as thick.

All the morels are edible, similar in appearance, and readily recognized, so that it is unnecessary to describe other species. They occur in thin woods, especially pines, in May and June. On account of their pitted surface, they must be cleansed very thoroughly, and because of their toughness and lack of flavor they must be cooked slowly a long time and well seasoned. Place them in a stewpan with butter, salt, pepper, and a little lemon juice, and cook slowly for an hour, adding at times a little beef gravy. The only poisonous species that might be confused

with the morels is *Gyromitra esculenta*, known by its dark red, irregular cap, which is not pitted, but folded and convoluted somewhat like the surface of the human brain; however, it occurs at the same time as the morels and assumes brownish hues with age. Although young and fresh specimens of *G. esculenta* are eaten without harm, old or decaying specimens or those kept too long before cooking have at times been found to contain helvellic acid, a deadly poison similar to that occurring in *Venenarius phalloides*, and it is therefore wise to refrain from using the plant for food in any form.

HYMENOMYCETES

Members of this large group produce their spores on thin membranes spread over the surfaces of gill-like structures or tubes or spines, or, in some cases, over the smooth surface of the sporophore. The chief families are: (1) Tremellaceae, sporophore irregularly expanded, gelatinous; (2) Thelephoraceae, spore-bearing surface even, pileus present; (3) Clavariaceae, spore-bearing surface even, sporophore club-shaped or bush-like and fleshy; (4) Hydnaceae, bearing spines; (5) Polyporaceae, tough or woody and tube-bearing; (6) Boletaceae, fleshy and tube-bearing; (7) Agaricaceae, bearing lamellae. The last two families are by far the most important for our present purpose.

Clavariaceae

The coral mushrooms are easily known by their striking resemblance to clusters of branched coral. They grow on the ground or on rotten wood in dense shade, and are usually whitish or yellowish in color. When tender and of mild flavor, they make a delicious dish. None of them are known to be poisonous, although some are insipid or bitter. A very common white

species of *Lachnocladium*, resembling *Clavaria*, will readily be recognized as much too tough for the human stomach. Coral mushrooms may be cooked as other mushrooms are, or escalloped, or stewed slowly for half an hour with the usual seasoning and a little lemon juice, then thickened and cooked longer until tender.

Clavaria flava Schaeff. Edible. Fig. 24

PALE-YELLOW CLAVARIA

Sporophore bushy, seven to fifteen centimeters high, five to ten centimeters wide; base thick, fleshy, white, dividing abruptly into a dense mass of erect, pale yellow branches, the tips more deeply colored but fading with age; context white, mild, of good flavor.

This excellent, as well as beautiful, species occurs rather abundantly in woods during warm, wet weather. In collecting it, the base should be examined for insects, which might give a disagreeable flavor to the whole plant. The golden Clavaria, *C. aurea*, is similar, but more deeply colored. The rarer red-tipped Clavaria, *C. botrytes*, has red-tipped branches, the color of which fades out with age. There is also an unbranched, club-shaped species, *Clavaria pistillaris*, which is often eaten.

HYDNACEAE

In this family, the spores are borne on the surface of spines. No poisonous species are known, but most of them are too tough or too poorly flavored to be recommended for food. *Fistulina* belongs to a related family which need not be discussed here.

Hydnum repandum L. Edible

SPREADING HYDNUM

Pileus convex to plane, irregular, very brittle, varying greatly in size, two to sixteen centimeters broad; surface dry, glabrous,

smooth, white to buff or brown, margin wavy; context white or whitish, tender; spines white or yellowish, straight, very brittle; stipe eccentric, usually clavate, concolorous or paler, two to ten centimeters long, one to two centimeters thick.

This species is widely distributed, occurring during late summer among moss or leaves in woods. It is too tender to require long cooking, but most directions call for an hour or more. If sliced and steeped for twenty minutes in warm water before cooking, the flavor seems to be improved. Some of the species of this genus that are bitter may be used if boiled for a short time in water before cooking. *Hydnum imbricatum* differs from *H. repandum* in being blackish-brown as though scorched and conspicuously scaly, with bluish-gray teeth. Although rather tough and dry, it is frequently eaten.

Hydnum caput-ursi Fries. Edible

BEAR'S HEAD HYDNUM

Large, fleshy, tuberculiform, immarginate, pendulous, rarely erect, white, seven to fifteen centimeters or more thick, the surface everywhere emitting short branches, which are clothed with branchlets and awl-shaped, deflexed spines one to twelve centimeters long; context firm, white, somewhat tough, of mild flavor; spores globose, hyaline, 5–6 μ.

This striking species occurs in temperate regions during summer and autumn on dead or dying trunks of deciduous trees, especially beech and birch. While somewhat tough, it can be made very attractive by proper cooking. *Hydnum coralloides*, resembling a mass of white coral, is a closely related species found chiefly on dead beech trunks. It is more tender and has an excellent flavor.

Fistulina hepatica (Huds.) Fries. Edible. Fig. 15

BEEFSTEAK FUNGUS

Pileus large, fleshy, very juicy, dimidiate to flabelliform, five to fifteen centimeters broad; surface dark red, somewhat sticky when moist, radiate-striate with age, margin entire to lobed; context thick, soft, tough, streaked with dark and light reddish lines, acid to the taste; tubes at first short, yellowish or pinkish, becoming three millimeters long, plainly distinct from one another, and dull ochraceous with age; spores ellipsoid, smooth, yellowish, 5–7 μ long; stipe usually short and thick, lateral, colored like the pileus, often reduced to a mere tubercle and sometimes wanting.

This species occurs on decaying trunks and stumps of chestnut, oak, and certain other deciduous trees in this country and in Europe. On account of its resemblance to a piece of beefsteak, it has long been recognized and used for food. It should be thoroughly cooked, and, if the acid flavor is objectionable, sodium carbonate should be added during the process of cooking. I have found this fungus much more common on chestnut than on oak, and I have noticed that foreigners regularly visit old chestnut stumps and trunks in the vicinity of New York during late summer and autumn to obtain it. Since the chestnut trees have all been killed by the canker, the beefsteak fungus should appear in great quantity for a time.

POLYPORACEAE

Most of the species of this group grow on dead wood in brackets of various sizes and shapes, the fruiting surface being composed of tubes or furrows. When the fruit-body is perennial, the tubes are often arranged in layers. Polypores as a class are very destructive to trees and timber. On the other hand, one species possesses medicinal properties, some of the encrusted

species supply tinder, and several of the more juicy ones are excellent for food if collected when young. The only species recognized as poisonous is the rare medicinal one, *Fomes Laricis*, usually known as *Polyporus officinalis*, and it is so tough and bitter that no one would think of eating it.

Grifola frondosa (Dicks.) S. F. Gray. Edible

Polyporus frondosus (Dicks.) Fries

FRONDOSE POLYPORE

Pileus imbricate-multiplex, fifteen to forty centimeters in diameter; pileoli very numerous, branching from a common trunk, imbricate or confluent, variable in size and shape, dimidiate to flabelliform, one and one-half to six centimeters broad; surface smoky-gray, fibrillose, radiate-striate; margin very thin, tough, fragile, having the odor of mice; tubes white, two to three millimeters long, mouths circular and regular when young, three to a millimeter, often large and angular with age, edges white, thin, entire to lacerate; spores subglobose to ellipsoid, smooth, hyaline; stipe tubercular, white, connate-rimose.

This large, branched species grows commonly at the base of oak trees or arises from their roots, on which it feeds. It also attacks the roots of chestnut trees, and in the Italian chestnut orchards it is often allowed to destroy the host because it is much esteemed in that region for food. It must be collected when young or it will become too tough. It is best broiled with butter for about twenty minutes, or it may be stewed for nearly an hour.

Laetiporus speciosus (Batt.) Murrill. Edible. Fig. 30

Polyporus sulphureus Fries

SULPHUR-COLORED POLYPORE

Hymenophore cespitose-multiplex, thirty to sixty centimeters broad; pileus cheesy, not becoming rigid, reniform, very broad,

more or less stipitate, 5–15 × 7–20 × 0.5–1 centimeter; surface finely tomentose to glabrous, rugose, anoderm, subzonate at times, varying from lemon-yellow to orange, fading out with age; margin thin, fertile, concolorous, subzonate, finely tomentose, undulate, rarely lobed; context cheesy, very fragile when dry, yellow when fresh, usually white in dried specimens, homogeneous, three to seven millimeters thick; tubes annual, two to three millimeters long, sulphur-yellow within, mouths minute, angular, somewhat irregular, three to four to a millimeter, edges very thin, lacerate, sulphur-yellow, with color fairly permanent in dried specimens; spores ovoid, smooth, or finely papillate, hyaline, 6–8 × 3–5 μ.

This very large and widely distributed species appears in conspicuous yellow clusters on dead spots in trunks of oak and various other trees, which are seriously attacked by it. It has long been used for food and can hardly be confused with harmful species. I have found it best broiled, when it reminds one of salmon.

Boletaceae

Many of the best edible fungi in temperate regions belong to this group, and the dangers of being poisoned are relatively small. Species with bitter or otherwise objectionable taste should be avoided, and especially all plants having red or reddish tube-mouths. The sensitive bolete, which promptly turns blue when touched or broken, has also caused poisoning in some cases. Many species have not been thoroughly tested, however; hence it is wise to eat sparingly of all such plants until well known.

Gyroporus castaneus (Bull.) Quél. Edible. Fig. 3

Boletus castaneus

Chestnut-colored Gyroporus

Pileus convex to subexpanded, slightly depressed, gregarious, three to seven centimeters broad; surface smooth, dry, minutely

but densely tomentose, orange-brown, fulvous, or reddish-brown; margin thin, usually paler; context white, firm, nutty in flavor, unchanging when wounded; tubes depressed, sinuate, short, watery-white becoming light yellow to dark cremeous, mouths angular, small, stuffed when young, the edges thin, entire; spores ellipsoid, smooth, hyaline to pale yellowish, 8–9 × 4.5–5.5 μ; stipe subattenuate above and below, cylindric or somewhat flattened, tomentose, bright brown, lighter at the apex, brittle, loosely stuffed, with a small cylindric cavity at the center, four to five centimeters long, six to ten millimeters thick.

This species is common in Europe and the United States in sandy soil at the edges of woods. It is rather small, and varies in color from orange-brown to chestnut; the flesh is white, unchanging, of mild flavor, and edible.

Tylopilus felleus (Bull.) P. Karst. Inedible. Fig. 43

Boletus felleus Bull.

BITTER BOLETUS

Pileus thick, convex, usually eight to fifteen centimeters broad, sometimes reaching a diameter of over forty centimeters; surface smooth, glabrous, variable in color, usually some shade of tan or chestnut, often pink or purplish when young; margin entire, concolorous; context white, often tinged with pink where wounded, at first firm, but soft and yielding in older specimens, decidedly bitter, especially when young, sometimes losing its bitter taste with age; tubes adnate, depressed, one to two centimeters long, slender, white, colored at maturity with the flesh-colored spores, mouths angular, of medium size, edges thin, entire; spores fusiform, smooth, flesh-colored, 8–11 × 3–4 μ; stipe cylindric, enlarged below, glabrous, subconcolorous, usually reticulate above, and sometimes entirely to the base, firm, solid, becoming spongy in large specimens, five to twelve centimeters long, one and one-half to two and one-half centimeters thick.

Found abundantly on the ground in woods throughout temperate North America, often reaching a foot or more in diameter.

It may be recognized by its pinkish tubes and usually very bitter flavor, which is not destroyed by cooking. It is therefore inedible, although not generally considered poisonous.

Ceriomyces crassus Batt. Edible. Fig. 1

Boletus edulis Bull., *Boletus separans* Peck

EDIBLE BOLETUS

Pileus thick, broadly convex, gregarious or cespitose, six to twenty centimeters broad, three to four centimeters thick; surface smooth, glabrous or finely tomentose, subopaque, dry, slightly viscid when moistened, sometimes pitted or reticulate-rimose, varying in color from ochraceous-brown to reddish-brown, sometimes paler; margin acute, entire; context compact, two to three centimeters thick, unchanging, white or yellowish, sometimes reddish beneath the cuticle, taste sweet and nutty; tubes adnate, at length depressed, plane in mass, white and stuffed when young, yellow or greenish-yellow when mature, changing to greenish-ochraceous when wounded, about two centimeters long, mouths of medium size, angular, edges thin; spores fusiform, smooth, greenish-yellow to ochraceous-brown, 12–15 × 5–6 μ; stipe subequal or enlarged below, stout, concolorous or considerably paler, becoming bluish or discolored when wounded, wholly or partially reticulate, solid, tough, fibrous, yellowish within, tinged with red at times near the surface, five to ten centimeters long, three to four centimeters thick.

This excellent species is abundant, well-known, and widely distributed in thin woods throughout temperate regions. The sporophore is large and usually yellowish-brown, while the stipe is more or less reticulate, especially above. In one variety, the stipe is reticulate to the base, and in another the stipe, as well as the cap, is brownish-lilac in color. It may be distinguished from *Tylopilus felleus* by its mild flavor and differently

colored tubes. This species is much used in Europe, and is often sliced and dried for winter use. It is best baked in a covered dish for an hour, after removing the tubes and stipe and cutting it into small pieces.

Ceriomyces scaber (Bull.) Murrill. Edible. Fig. 2

Boletus scaber Bull.

ROUGH-STEMMED BOLETUS

Pileus convex, three to twelve centimeters broad; surface very variable in color, white, red, or brown, usually smooth and glabrous; context white, becoming slightly darker or flesh-colored when bruised; tubes long, slender, depressed about the stipe, white or stramineous, becoming brownish with age and flesh-colored or blackish when bruised; spores oblong, smooth, brown, 13–16 μ long; stipe firm, solid, tapering upward, whitish, roughened with numerous reddish or brownish dots or scales.

This is a very handsome edible species and the most abundant of the fleshy tube-bearing fungi, being found on the ground in woods or groves from June to November. It varies greatly in size and color.

Ceriomyces ferruginatus (Batsch) Murrill. Poisonous

Boletus piperatus Bull.

PEPPERY BOLETUS

Pileus convex to plane or nearly so, umbonate when young, circular in outline, two to five centimeters broad, reaching seven centimeters at times; surface smooth, glabrous, sometimes rimose-areolate, slightly viscid in damp weather, varying from ochraceous to fulvous; margin regular, entire, sometimes quite thick because of the lengthening of the marginal tubes; context thickest at the center and gradually thinner toward the margin, yellow or yellowish-white for the most part, but light pink or roseous next to the layer of tubes, darker when exposed to the

air, acrid and peppery, remarkably free from insects; tubes adnate, at length depressed around the stem, latericeous, becoming slightly darker when wounded, tinged with ferruginous at the maturity of the spores, equal to or longer than the thickness of the context, mouths large, angular, unequal; spores subfusiform, ferruginous, 9–11 × 4 μ; stipe central, slender, nearly equal, two to five centimeters long, four to five millimeters thick, rarely reaching seven centimeters in length and eight millimeters in thickness, pulverulent, slightly veined above, smooth below, usually somewhat paler than the pileus, citrinous or flavous at the base, solid, fleshy, and yellow within.

This small species occurs rather rarely throughout the Northern United States and Canada in woods and open places near woods. It may be recognized by its yellow cap, acrid and peppery context, and brick-colored tubes. Stevenson pronounced it poisonous, but McIlvaine claims that it loses its peppery taste on cooking and becomes harmless.

Ceriomyces miniato-olivaceus (Frost) Murrill. Poisonous

Boletus miniato-olivaceus Frost

Sensitive Boletus

Pileus firm, convex, becoming nearly plane and somewhat spongy with age, cespitose, becoming olivaceous or ochraceous-red, changing to blue when handled; margin acute, slightly exceeding the pores; context pale yellow, changing immediately to blue when wounded, mild or slightly unpleasant to the taste, said to be poisonous; tubes adnate or subdecurrent, slightly depressed, bright lemon-yellow tinged with green, becoming brownish-yellow with age, changing to blue when wounded, mouths subangular, of medium size; spores oblong-ellipsoid, smooth, yellowish-brown, 10–13 × 4–6 μ; stipe equal or enlarged above or below, pale yellow with pink markings, especially near the base, glabrous, faintly reticulate at the top, solid, yellow within, six to ten centimeters long, one-half to one and one-half centimeters thick.

Found in open woods or wood borders from Maine to North Carolina. It is easily distinguished among the red boleti by its quick change to blue at any point, either outside or inside, where bruised or even touched with the fingers. This species is recognized as distinctly poisonous to some people, although others can eat it without danger.

Suillellus luridus (Schaeff.) Murrill. Poisonous. Fig. 42

Boletus luridus Schaeff.

LURID BOLETUS

Pileus convex, gregarious or subcespitose, five to twelve centimeters broad; surface dry, smooth, glabrous or minutely tomentose, sometimes clothed with rather conspicuous, appressed, felted fibers, occasionally rimose-areolate, brown with shades of red or yellow, often bright brownish-red, becoming paler with age; margin thick, obtuse, entire, sometimes slightly differing in color; context firm, whitish to flavous, quickly changing to blue when wounded, sometimes unchanging in older plants, considered somewhat poisonous; tubes nearly free, rarely adnate, plane, or slightly convex in mass, yellow within, changing to dark greenish-blue when wounded, mouths small, circular, cinnabar-red, becoming brownish-orange, darker with age; spores oblong-ellipsoid, smooth, olivaceous when fresh, 11–16 $\times$ 4–6 μ; stipe subequal, five to ten centimeters long, one to two centimeters thick, usually furfuraceous or punctate, at times nearly glabrous, rarely reticulate at the apex or on the upper half, red or reddish-brown below, yellow or orange above, the dots rosy or dark red, solid, yellow within, varied with red or purple.

This is one of the most variable species in the family of fleshy, terrestrial, tube-bearing fungi, but the small genus to which it belongs is readily recognized by its red or reddish tube-mouths, and all of its species should be avoided by mushroom eaters

until their properties are better known. This particular species is said to contain a small amount of muscarine or closely allied alkaloid, as well as choline, although it is often eaten. When cut, the entire cut surface of the cap, tubes, and stem changes at once to blue. It occurs in abundance throughout temperate North America and Europe on clay banks or roadsides in open deciduous woods.

Rostkovites granulatus (L.) P. Karst. Edible. Fig. 5

Boletus granulatus L.

GRANULATED BOLETUS

Pileus subhemispheric to nearly plane, gregarious, rarely cespitose or solitary, four to ten centimeters broad, one to one and one-half centimeters thick; surface very viscid, with easily separable cuticle, very variable in color, usually pinkish-gray to reddish-brown fading to yellowish, often obscurely spotted, especially at the center; margin sterile, projecting, incurved and somewhat appendiculate when young; context thick, compact, elastic, pale yellow next to the tubes, white above, unchanging when wounded, taste mild, somewhat mucilaginous; tubes short, less than five millimeters, adnate, subdecurrent, plane in mass, simple, subcircular, irregular, edges rather thick, flecked with pinkish-brown glandules; spores fusiform, pale yellowish-brown, 7.5–9.5 × 2.5–3.5 μ; stipe short, thick, subequal or enlarged below, white or pale yellow, dotted with pinkish-brown droplets which become darker on drying, solid, white within, two and one-half to five centimeters long, one to one and one-half centimeters thick.

This abundant and widely distributed species occurs from midsummer until frost in sandy open ground under or near conifers. *Rostkovites subaureus*, with yellow cap usually streaked with red, often grows with it in eastern North America. Both are among our finest edible species and can hardly be mistaken for dangerous kinds.

Boletus luteus L. Edible. Fig. 10

EGG-YELLOW BOLETUS

Pileus convex, solitary, five to ten centimeters broad; surface smooth, glabrous, very viscid, yellowish-brown, grayish-brown, or reddish-brown, sometimes streaked, becoming darker and duller with age; margin thin, entire or undulate; context compact, pale yellowish, darker with age, unchanging when wounded, edible; tubes one and one-half to two and one-half millimeters long, plane or convex in mass, adnate or slightly decurrent, somewhat depressed, dark melleous, unchanging when wounded, darker with age, mouths one millimeter in diameter, nearly circular, the edges adorned with reddish-brown dots; spores oblong-fusiform, smooth, yellowish-brown, 6–9 × 2.5–4 μ; stipe slightly tapering downward, pale yellow to reddish-brown, glandular-dotted both above and below the annulus, solid, yellowish and unchanging within, about three to six centimeters long, one to two centimeters thick; annulus large, membranous, white to slightly brownish, glandular-dotted, persistent.

Common in sandy soil in coniferous or mixed woods throughout the eastern United States. Edible.

Strobilomyces strobilaceus (Scop.) Berk. Edible. Fig. 21

PINE-CONE BOLETUS

Pileus hemispheric to expanded, five to ten centimeters broad; surface dry, soft and spongy, blackish-umbrinous, adorned with thick, projecting, floccose, squarrose, blackish scales; margin fringed with scales and fragments of the veil; context white or whitish, changing to red and then to black when wounded, mild to the taste, edible; tubes adnate, often depressed, white or cinereous, changing like the context when wounded, becoming brown or blackish with age, mouths large, angular; spores subglobose, asperulate, blackish-brown, 8–11 μ long; stipe equal or slightly tapering upward, sulcate-striate at the apex, densely floccose-tomentose, brown or blackish below, lighter above, solid,

firm, fragile, six to twelve centimeters long, one to two centimeters thick; veil dense, cottony, white to grayish, adhering to the margin and to the stipe in mature plants.

This common edible species is known by its black color and shaggy appearance. Its flesh is white, changing to reddish and finally to black when wounded. It is abundant on shaded banks in woods throughout temperate North America, especially in northern regions.

Agaricaceae

Gill-fungi are usually divided into groups based on the color of their spores as seen under a microscope or in mass on a piece of paper upon which a mature pileus has rested, gills downward, for an hour or more. The spore-prints thus obtained will be found to be variously colored: white, yellowish, rosy, ochraceous, rusty, brown, purplish-brown, and black. The white-spored, brown-spored, and black-spored groups contain most of the recognized edible and poisonous species.

Chanterel Chantarellus (L.) Murrill. Edible. Fig. 6

Cantharellus cibarius Fries

Edible Chanterel

Pileus fleshy, firm, turbinate, nearly plane, sometimes depressed, gregarious, cespitose at times, three to eight centimeters broad; surface glabrous, luteous, rarely paler yellow, margin involute to expanded, undulate; context white, nutty or slightly acrid, edible; lamellae thick, narrow, distant, decurrent, forked or irregularly anastomosing, luteous, or sometimes much paler; spores ellipsoid, somewhat irregular, smooth, pale-ochraceous, 8–10 × 4–5 μ; stipe attenuate below, glabrous, concolorous or paler, solid, two and one-half to five centimeters long, six to twelve millimeters thick.

Common throughout temperate regions in deciduous or coniferous woods, especially in dense evergreen thickets, appearing

in midsummer. It is egg-yellow all over, and has peculiar narrow, blunt, decurrent lamellae. It has long held a high reputation for edibility, and the only poisonous species with which it may easily be confused is *Chanterel aurantiacus*. It should be stewed for nearly an hour and seasoned with butter or meat gravy. It is an excellent addition, also, to hashes, meat stews, and omelets.

Chanterel aurantiacus (Wulf.) Fries. Doubtful. Fig. 47

ORANGE CHANTEREL FALSE CHANTEREL

Pileus compressed, hemispheric to funnel-shaped, convex to expanded, plane to depressed, fleshy, flexible, gregarious to subcespitose, three to six centimeters broad; surface subtomentose, pale orange, often darker at the center, margin involute, entire to undulate; lamellae decurrent, crowded, narrow, rather thin, regularly and two to four times dichotomous, bright orange; spores ellipsoid, smooth, hyaline, $5–7 \times 3–4\ \mu$; stipe usually central, cylindric, enlarged below, slightly ascending, two to five centimeters long, four to seven millimeters thick, subglabrous above, tomentose below, stuffed, subconcolorous, varying to pallid or dark brown.

In woods, on decayed wood, or on soil rich in humus, from Canada to South Carolina and Nevada. It was long considered dangerous, but very recently Sartory investigated it in France and declared it harmless. Later, Dr. Peck tried it and added it to his list of edible species. I still believe it is slightly poisonous to some and should not be eaten, but it is gratifying to know that amateur mycophagists may now eat *Chanterel Chantarellus* without very much risk.

LACTARIA

Many species of this genus were formerly considered poisonous on account of their acrid taste, but, since it has been found that

these peppery, resinous substances are usually decomposed on cooking, it will be necessary to make an experimental revision of the genus. *Lactaria rufa* seems to have the worst reputation, from all accounts, while *L. fuliginosa*, *L. vellerea*, *L. pyrogala*, *L. torminosa*, and *L. theiogala* are pronounced either poisonous or suspicious by most authors. Care should be exercised in collecting members of this genus for the table. The species considered harmful may usually be distinguished by their acrid flavor.

Lactaria deliciosa (L.) Fries. Edible. Fig. 16

DELICIOUS LACTARIA

Pileus fleshy, convex-umbilicate, becoming plane, then infundibuliform, five to twelve centimeters broad; surface orange, yellow-orange or paler, zoned with deeper orange, becoming paler with age, sometimes mixed with grayish and greenish tints, viscid when wet, glabrous, somewhat roughened; margin involute, then arched and at length upturned, glabrous; context firm, yellowish, often staining greenish next to the lamellae and the exterior of the stipe, edible; latex orange to red-orange, aromatic and somewhat acrid; lamellae deep-orange with yellowish reflections, paler when old, often becoming greenish with age or where bruised, many forking near the stipe, and shorter ones branching into longer ones, often connected with cross veins at the base, close, somewhat decurrent, rather narrow; stipe of the same color as the pileus, spotted with brighter orange, nearly equal, glabrous, or sometimes a little tomentose at the base, smooth, stuffed, becoming hollow, two and one-half to ten centimeters long, eight to twelve millimeters thick; spores yellow, subglobose to ellipsoid, slightly echinulate, more or less hyaline, 8–8.5 × 8–11 μ.

In moist woods, especially under firs and hemlocks, in mountainous regions throughout most of the United States, but not so common as in Europe. Long considered one of the best mushrooms and readily recognized by its orange-red milky juice,

which becomes greenish on exposure to the air. It should be cooked slowly for nearly an hour. I have not found it so delicious, but rather coarse.

Lactaria lactiflua (L.) Burl. Edible

Lactaria volema Fries

ORANGE-BROWN LACTARIA

Pileus fleshy, convex, then nearly plane or slightly depressed, five to thirteen centimeters broad; surface fulvous, buff, or brownish-terra-cotta to brownish-orange, sometimes much paler, azonate, dry, glabrous, smooth, or at length rimose-rivulose; margin involute at first, then extended; context firm, thick, whitish, changing brown where exposed to the air, having a strong, persisting odor, edible; latex white, unchanging, mild, sticky, abundant; lamellae creamy-white or tinged with the same color as the pileus, becoming darker with age, changing brownish where injured, often forking two or three millimeters from the stipe or midway to the margin, close, adnate, two to five millimeters broad; stipe of nearly the same color as the pileus but paler, nearly equal, glabrous, pruinose, solid, sometimes becoming hollow, two to ten centimeters long, one to two centimeters thick; spores white, globular, echinulate, 7–10 μ in diameter; cystidia 20–35 μ long, colorless or yellowish.

Common in woods and groves, especially near oak trees, throughout the eastern United States.* When raw, the flavor is somewhat unpleasant and astringent, but it is fairly good when cooked slowly for forty minutes. It should be very carefully distinguished from the poisonous *Lactaria rufa*, which is bay-red to rufous and very acrid.

Lactaria rufa (Scop.) Fries. POISONOUS. Fig. 36

BAY-RED LACTARIA

Pileus fleshy, rather thin, convex, umbonate, at length infundibuliform, five to ten centimeters broad; surface bay-red

* *Lactaria hygrophoroides* Berk. & Curt. (Fig. 17) resembles this species.

to rufous, not fading, azonate, dry, minutely flocculose-silky, becoming glabrous and shining; margin involute at first, whitish-downy, becoming glabrous; context not very compact, pallid or tinged with pink, odorless, very poisonous; latex white, unchanging, very acrid; lamellae ochraceous, then rufous, sometimes forking, somewhat decurrent, three millimeters broad; spores subglobose to broadly ellipsoid, slightly echinulate, hyaline, 7–8 μ in diameter; stipe rufous, but often paler than the pileus, nearly equal, dry, glabrous or sometimes pruinose and downy at the base, stuffed, firm, at length sometimes hollow, five to ten centimeters long, six to ten millimeters thick.

I have found this species common in damp woods in northern Europe, where it is considered dangerously poisonous and is liable to be confused with the edible *Lactaria lactiflua*. In America, it is rare and does not seem to extend farther south than New York nor farther west than Michigan.

Lactaria piperata (L.) Pers. Edible

PEPPERY LACTARIA

Pileus fleshy, convex-umbilicate, at length infundibuliform, four to twelve centimeters or more in diameter; surface white, azonate, dry, glabrous; margin involute at first and naked, at length uplifted; context compact, white, unchanging or becoming sordid, edible; latex white, unchanging, very acrid, abundant; lamellae white or creamy-white, forking dichotomously, close, more or less decurrent, arcuate at first, then extending upward, only about two millimeters broad; stipe white, equal, dry, often pruinose, solid and firm, two to eight centimeters long, up to two centimeters thick; spores white, subglobose, nearly smooth, 8–9 μ in diameter.

Found in great abundance in oak woods throughout temperate North America. It contains an acid and a resin, "piperon," which is extremely acrid in the fresh state, but is disorganized by heat. This species is therefore harmless when cooked, but is

coarse and poorly flavored. If eaten, it must be carefully distinguished from poisonous species that are acrid in the fresh state. *L. torminosa* appears to contain a poison which is destroyed by heating.

Russula

Most of the species of this genus are edible, and some of them are particularly good, but they are usually scattered, are fragile and perishable, become infested early with a variety of insects, are eaten by squirrels and other animals, and resemble one another so closely that it is advisable to go to the trouble of tasting nearly every specimen before selecting it for the table. There are no violently poisonous species known in this genus, and if specimens have mild taste and an agreeable odor they are probably harmless, but it must always be remembered that it is necessary to test each new species thoroughly before using it in any quantity for food. *Russula emetica* is poisonous, containing choline, pilz-atropine, and probably muscarine; *R. foetens* is also poisonous, but in a lesser degree; while *R. nitida*, *R. fragilis*, and other species belong to the mildly poisonous or suspected class.

Russula delica Fries. Edible

Short-stemmed Russula

Pileus fleshy, of medium thickness, firm, broadly convex-umbilicate, then spreading, and at length infundibuliform, eight to sixteen centimeters broad; surface white, sometimes with yellowish stains when the pileus has brought soil up with it, easily staining yellowish in drying, dry, glabrous, or sometimes under the lens appearing obscurely tomentose from the pulling apart of the fibers in the outer layer; margin even, involute, late in expanding; context firm, white, unchanging where bruised, slowly becoming slightly acrid; lamellae white, the edges often becoming faintly glaucous-green when mature or in the process

of drying, becoming yellowish where rubbed, some equal, some forking, narrowed at both ends, decurrent, subdistant to distant, rather narrow; spores hyaline, subglobose, tuberculate, 10 × 9 μ; stipe white, sometimes with a glaucous-green ring at the apex, glabrous or sometimes slightly downy at the apex under a lens, two to five centimeters long, one to two centimeters thick.

Found commonly in dry woods, especially under conifers, from Maine to Alabama and west to Colorado. It very much resembles *Lactaria piperata*, but is without milky juice and the hymenium is usually tinged with glaucous-green. Peck includes it in his list of edible fungi and remarks that it is excellent fried in butter. It is more compact and lasts longer than most species of *Russula*.

Russula Mariae Peck. Edible. Fig. 4

MARY'S RUSSULA

Pileus fleshy, convex and subumbilicate to depressed, reaching seven centimeters broad; surface dry, rose-red or purple with darker disk, having a bloom like a peach, margin slightly striate at times, especially in old plants; context thin, of good flavor, white, pinkish under the cuticle, odor not characteristic; lamellae white or stramineous, broad, subcrowded, interveined; spores subglobose, minutely conic-tuberculate, yellow, 7 μ; stipe equal, solid, rosy, sometimes partly white, glabrous, about one and three-tenths to one and one-half centimeters thick.

This is one of our prettiest species, and it may be looked for under oaks anywhere in the eastern United States after summer rains. It is distinguished from poisonous species similar in color by its mild flavor when raw.

Russula emetica Fries. Poisonous. Fig. 44

EMETIC RUSSULA

Pileus regular, firm to fragile, convex to plane or depressed, five to eight centimeters broad; surface viscid when young,

polished, red, often fading to pallid or yellowish, cuticle separating very readily; context white, reddish under the cuticle, very acrid to the taste; lamellae white, then dull-yellowish, free, subdistant, broad, equal; spores globose, echinulate, hyaline, 8–10 μ; stipe rosy or whitish, glabrous, spongy-solid, three to seven centimeters long, one to one and one-half centimeters thick.

Common in woods throughout Europe and the eastern United States, often growing where logs have decayed. Distinguished by its red color, viscid surface, readily separating cuticle, and very acrid taste. In addition to its acrid quality, it is definitely poisonous, containing small quantities of choline, pilz-atropine, and probably muscarine. When taken in any quantity, it acts as a prompt emetic. It is mainly because of this species that most specimens of *Russula* should be tasted before selecting them for food.

Russula virescens (Schaeff.) Fries. Edible

GREEN RUSSULA

Pileus fleshy, globose, becoming convex, then nearly plane and often centrally depressed, five to twelve centimeters broad; surface green or grayish-green, dry, with small, flocculose patches or warts resembling those of *Venenarius;* margin even, rarely slightly striate in old specimens; context white, mild to the taste; lamellae white, a few short ones present, some forking, narrow toward the stipe and nearly or quite free, rather crowded; spores subglobose, echinulate, hyaline, 7×8 μ; stipe white, firm, nearly equal, two and one-half to five centimeters long, one and one-fifth to two centimeters thick.

Found in oak, maple, or mixed woods from Maine to Virginia and westward to Michigan and Ohio. This beautiful species has long enjoyed a reputation for edibility, but, unfortunately, it is rather rare and its flavor is not really of first rank. It may be recognized by the greenish color and warted appearance of its pileus. The pileus of *Russula furcata*, a bitter species formerly

considered poisonous, is green but not warted. The green form of *Venenarius phalloides* and the poisonous *Entoloma lividum*, both common in Europe, are easily distinguished by other characters.

Russula flava Romell. Edible. Fig. 18

YELLOW RUSSULA

Pileus fleshy, broadly convex, becoming plane or slightly depressed in the center, five to eight centimeters broad; surface flavous or golden-yellow, sometimes discolored with age, viscid when wet, glabrous; margin even to slightly striate when mature; context white, becoming gray with age and in drying, the taste mild; lamellae white, becoming pale-yellow, then gray with age, equal, not forking, adnexed, close, broader at the outer ends; spores pale-yellow, globose, echinulate, 8–9 μ in diameter; stipe white, becoming more or less gray with age or in drying, nearly equal, obscurely reticulate-rivulose, spongy, five to eight centimeters long, one to two centimeters thick.

Found in mixed woods from New England westward to Michigan. Unfortunately, neither this species nor the two other beautiful yellow species, *Russula lutea* and *Russula flavida*, are very abundant.

Russula foetens Pers. Poisonous. Fig. 45

FETID RUSSULA

Pileus firm, rather thin, globose to plane or slightly depressed, five to ten centimeters broad; surface very viscid, slimy, conspicuously striate-tuberculate, ochraceous-melleous, testaceous-fulvous in the center with small, bay or blackish areas; context whitish, tardily acrid and mucilaginous to the taste, with the odor of prussic acid; lamellae mostly equal, adnate or adnexed, subcrowded, arcuate, white, staining brownish when injured, usually decorated with small drops of water when the air is damp; spores globose, strongly echinulate, hyaline, 10 μ; stipe cylindric, equal or somewhat ventricose, glabrous or subglabrous,

white, staining brownish when injured, hollow, five to eight centimeters long, one to two centimeters thick.

This conspicuous species is common under oaks in groves or woodlands throughout most of Europe and the United States, sometimes occurring in great quantity in one spot. Its odor is similar to that of peach kernels, and in some specimens it is strong and unpleasant, although at times it may be scarcely noticeable. This unpleasant odor and the very slimy character of the surface render the plant unattractive and one would hardly collect it for food. It is known to be definitely poisonous to a certain extent and should always be avoided by mycophagists.

Panellus stypticus (Bull.) P. Karst. Poisonous. Fig. 40

Panus stypticus (Bull.) Fries

ASTRINGENT PANUS

Pileus tough, conchate, spatulate to reniform, about one to three centimeters broad; surface isabelline to subfulvous, nearly even, zoned at times, the cuticle breaking into granules or small scales, margin entire or lobed, incurved when young; context thin, firm, rather tough, watery-white, the taste not always evident at once, but becoming strongly acrid and astringent; lamellae narrow, thin, crowded, interveined, isabelline, determinate; spores globose, smooth, hyaline, $2–4 \times 1–3\ \mu$; stipe lateral, short, swollen above, solid, compressed, pruinose, pale isabelline or dull white above, darker below.

This small, inconspicuous species is common throughout temperate regions during autumn and winter on stumps of deciduous trees in woods. It is phosphorescent, and also poisonous, possessing a strongly acrid and astringent taste, but it would hardly be collected for food if well-flavored because of its small size and apparent toughness.

Marasmius oreades (Bolt.) Fries. Edible. Fig. 29

FAIRY-RING MUSHROOM SCOTCH BONNETS

Pileus convex to expanded, often umbonate, slightly striate at times when moist, fleshy-tough, drying easily, two to five centimeters broad; surface glabrous, buff or tawny, fading with age or on drying; context thin, white, of pleasant odor and taste; lamellae broad, distant, free or adnexed, yellowish-white; spores subellipsoid, smooth, hyaline, 7–9 μ long; stipe cylindric, rather slender, solid, tough, yellowish-white, villose-tomentose, five to eight centimeters long, two to four millimeters thick.

This very excellent little species is to be looked for in pastures during spells of wet weather in late summer or autumn. Its habit of growing in circles will aid one in recognizing it. It should be cooked for some time, owing to its tough texture. One should be very careful in picking small fungi growing on lawns for table use, to avoid getting *Marasmius urens; Inocybe infida*, a dangerous species with yellowish-brown spores; and certain species of *Panaeolus*, having black spores.

Crepidopus ostreatus (Jacq.) S. F. Gray. Edible. Fig. 9

Pleurotus ostreatus (Jacq.) Quél.

OYSTER MUSHROOM

Pileus convex or nearly plane, irregularly fan-shaped, eccentrically or laterally stipitate, cespitose, imbricate, five to twelve centimeters broad; surface smooth, glabrous, variously colored, usually white, yellowish or brownish; context white, mild-flavored, somewhat tough; lamellae broad, white, decurrent, rather distant, reticulate behind; spores white tinged with lilac when shed on paper, 8–12 $\times$ 3–4 μ; stipe eccentric or lateral, short or wanting, varying according to position in the cluster, strigose-hairy at the base.

Very common on dead trunks of deciduous trees, especially elm, from June to November. In Hungary, it is cultivated on

sections of elm logs. The sapid mushroom, *Crepidopus cornucopiae*, is confused with it in this country and for our present purpose need not be distinguished, as its properties are similar. Both species are rather tough and lack flavor but they occur in such large masses and are so readily recognized that they are to be recommended for general use as food. The young and tender caps should be selected and cooked slowly in a sauce pan for at least twenty minutes. The only similar poisonous species known is the tiny *Panellus stypticus*, found on the tops of stumps and readily distinguished by its acrid, astringent taste.

Gymnopus carnosus (Sow.) Murrill. Inedible. Fig. 37

Collybia maculata (Alb. & Schw.) Quél.

SPOTTED COLLYBIA

Pileus fleshy, firm, convex or nearly plane, five to ten centimeters broad; surface even, glabrous, white or whitish, often variegated with reddish spots or stains; context white; lamellae narrow, crowded, adnexed, sometimes nearly or quite free, white or whitish; spores subglobose, at times slightly apiculate at one end, 4–6 μ; stipe firm, striate, white, usually stout, equal or subequal, often curved below, commonly attenuate and radicate at the base, five to ten centimeters long, six to twelve millimeters thick.

This species is one of the largest of the genus and occurs in humus or on much decayed wood in woods throughout the greater part of the eastern United States, as well as in Europe. The surface is usually decorated with rusty or reddish spots or stains, but varieties occur in which these spots are entirely absent. It is very bitter, even when thoroughly cooked.

Clitocybe sudorifica Peck. Poisonous. Fig. 46

SWEAT-PRODUCING CLITOCYBE

Pileus fleshy but thin, broadly convex or nearly plane, often becoming slightly depressed in the center or umbilicate, irregular and splitting or lobed on the thin spreading margin, gregarious, two to four centimeters broad; surface glabrous, watery-white when moist, whitish or grayish-white when dry: context watery when moist, white when dry, the taste mild, the odor none; lamellae thin, narrow, crowded, adnate or slightly decurrent, whitish: spores subglobose, 4–5 × 3–4 μ: stipe short, equal or sometimes narrowed at the base, glabrous or merely pruinose, stuffed with a white, soft or spongy center or hollow when old, often curved or somewhat flexuous, white or whitish, one to three centimeters long, two to four millimeters thick.

This plant has been found in open grassy places in northern New York and is apparently a poisonous variety of the common edible species, *Clitocybe dealbata*. At least, there seems to be no way of distinguishing the two morphologically. When eaten, this variety acts like a small quantity of *Venenarius muscarius*, causing profuse perspiration, and has been used to break up a cold.

Another very closely related plant, *Clitocybe morbifera*, was described by Peck from specimens collected on lawns in Washington, D. C. It is said to have a very disagreeable and persistent taste. In Bulletin 150, Peck reports specimens sent by Dr. Whetstone from Minneapolis, Minnesota, and by Dr. Fischer from Detroit, Michigan, and in both cases sickness was produced after the fungus had been eaten in quantity. Dr. Peck concludes that although *C. morbifera* is scarcely distinguishable morphologically from *C. sudorifica* the ill effects of the former are much more serious and uncomfortable than those of the latter species. Specimens of *C. dealbata* collected by the author

at Seattle, Washington, were compared at Albany with specimens of *C. morbifera* collected by Dr. Whetstone in Minnesota in 1905, and found to agree in every particular.

Clitocybe multiceps Peck. Edible. Fig. 25

MANY-HEADED CLITOCYBE

Pileus convex to expanded, cespitose, three to eight centimeters broad; surface smooth, glabrous, watery-white to pale avellaneous-isabelline, the disk more grayish; context milk-white, mild, somewhat oily, firm, and persistent; lamellae adnate or slightly decurrent, rarely sinuate, white or pale stramineous, close, and narrow; spores globose, smooth, hyaline, 5–7 μ; stipe cylindric, equal, solid or stuffed, firm, white or pale stramineous, pruinose above, five to ten centimeters long, seven to fifteen millimeters thick.

This species occurs in wet weather in dense clusters on lawns, especially in rather long grass, and is usually found in great abundance when found at all. Its context is firm, with a slight oily flavor, and sporophores may be kept for several days before cooking. It is known only from New York and a few other states, but should stand transplanting in sod rather easily. Having used it in quantity from my own lawn, I can recommend it as a valuable edible species.

Monadelphus illudens (Schw.) Earle. Poisonous. Fig. 33

Clitocybe illudens (Schw.) Sacc.

DECEIVING CLITOCYBE JACK-MY-LANTERN

Pileus convex to plane or depressed, irregular, often umbonate, densely cespitose, ten to twenty centimeters broad; surface glabrous, saffron-yellow; context thick, white or yellowish, becoming sordid with age, with a somewhat disagreeable or bitter flavor and at times a strong odor; lamellae broad, decurrent, saffron-yellow; spores abundant, globose, hyaline, 4–5 μ;

stipe long, firm, glabrous, concolorous, tapering toward the base of the cluster.

This species is readily recognized by its large size and brilliant coloring. It occurs throughout the eastern United States from midsummer to autumn in large clusters about dying trunks and stumps of deciduous trees. On dark nights, these clusters and also pieces of dead wood containing the mycelium are usually conspicuously phosphorescent. The plant is distinctly poisonous, showing a muscarine reaction on the nerves of the heart, and producing nausea, vomiting, and diarrhea. Atropine is an antidote for the depressing effects of this poison.

Lepista personata (Fries) W. G. Sm. Edible. Fig. 8

Tricholoma personatum (Fries) Quél.

MASKED TRICHOLOMA BLEWITS

Pileus thick, firm, convex to expanded, five to twelve centimeters broad; surface moist, glabrous, lilac or purple, fading to grayish, becoming slightly brownish on the disk; margin inrolled and frosted when young, glabrous and often irregular with age; context white, firm, pleasant to the taste, becoming dull colored with age; spores ellipsoid, smooth, dingy-white, dull pinkish in mass, 7–10 μ long; stipe short, solid, often bulbous at the base, fibrillose to glabrous, lilac or violet, three to six centimeters long, one and one-half to three centimeters thick.

This exceedingly valuable species is of excellent flavor and not easily confused with dangerous species. It may be found in open woods or among weeds or long grass in rich fields during the autumn months. Its large size and the violet or lilac tint of all its parts should distinguish it from most other species. In large, mature specimens, the flesh becomes soft and readily absorbs water during wet weather, which somewhat changes the appearance of the mushroom and lessens its value for edible

purposes. Only one species of *Tricholoma*, *T. sulphureum*, with a strong and disagreeable odor, is considered to any extent dangerous, although not all have been tested. Certain species in other genera resembling *L. personata* in color, *Laccaria laccata*, *Laccaria ochropurpurea*, *Cortinarius violaceus*, *Cortinarius alboviolaceus*, and *Lactaria Indigo*, are all edible.

Armillaria putrida (Scop.) Murrill. Edible. Fig. 28

Armillaria mellea (Vahl) Quél.

HONEY AGARIC

Pileus convex to expanded, cespitose, very variable, four to twelve centimeters broad; surface usually dry, smooth or becoming striate toward the margin, pale honey-yellow to dark reddish-brown, usually adorned with minute tufts of brown or blackish hairs, which are more abundant on the disk; context white or whitish, somewhat acrid and unpleasant to the taste; lamellae adnate or slightly decurrent, white or whitish, becoming discolored or spotted with age; spores ellipsoid, smooth, hyaline, 7–10 μ long; annulus white, cottony, with dark specks, or thin, arachnoid, and evanescent; stipe melleous, reddish-brown or dirty-brown below, paler above, nearly equal, firm, fibrous, spongy within, usually floccose-scaly below the annulus, four to twelve centimeters long, five to fifteen millimeters thick.

Very widely distributed and very abundant on stumps and buried roots of both deciduous and evergreen trees, on which it grows as a parasite, the sporophores appearing in dense clusters in autumn and the shining brown cords, or "rhizomorphs," being often seen in dead logs and stumps. Although of inferior quality, it is much used as food. When raw, the flavor is unpleasant, and it was therefore formerly considered poisonous. Only the young and tender caps should be selected.

Lepiota procera (Scop.) Quél. Edible

PARASOL MUSHROOM

Pileus soft, fleshy, ovoid to expanded, umbonate, solitary or gregarious, eight to sixteen centimeters broad; surface radiate-fibrillose and rufescent beneath the cuticle, the cuticle thick, at first smooth and continuous, whitish or rufous to umber in color, at length torn asunder, except upon the umbo, into large irregular scales which become scattered and gradually fall away, margin deflexed, silky-fibrillose; context thick, soft, white; lamellae broad, close, white, at times yellowish or pinkish, tapering slightly behind, free, remote; spores ellipsoid or obovoid, apiculate, 1–2-guttulate, 12–18 × 8–12 μ; stipe tall, tapering upward from the bulbous base, hollow or fibrous-stuffed, the cuticle thin, flocculose, rufous or brownish, at length drawn apart into minute scales, fifteen to twenty-five centimeters long, eight to sixteen millimeters thick, the base two to three centimeters thick; annulus thick, soft, subcoriaceous, movable, apical.

This handsome edible species is found rather sparingly in thin soil in meadows, pastures, and open woods from New England to Alabama and west to Nebraska. It is also widely distributed in Europe and Asia, where it is highly esteemed as an article of food, in some places being dried in quantity for winter use. It should be cooked quickly with dry heat. On account of its scaly cap and bulbous stem, it must be very carefully distinguished from species of *Venenarius*. In *Lepiota*, the scales are a part of the cap and do not separate readily; in *Venenarius*, they are fragments of the roof of the volva and may be easily removed from the cap. The parasol mushroom also differs from species of *Venenarius* in having a free and movable instead of a fixed ring, and in having no cup nor fragments of a cup at the base of the stem, although the base is swollen.

Lepiota americana Peck. Edible

AMERICAN LEPIOTA BLUSHING LEPIOTA

Pileus ovoid to convex and at length expanded, umbonate, five to fifteen centimeters broad; surface white, umbo and scales reddish-brown, the entire plant becoming reddish-brown when wounded or on drying; lamellae white, free, close; spores subellipsoid, smooth, hyaline, uninucleate, 7.5–10 × 5–7 μ; stipe thickened below, white, hollow, seven to twelve centimeters long; veil white, forming an apical annulus.

A conspicuous and easily recognized edible species of wide distribution in America, occurring in groups or clusters on rich lawns or about old stumps, sawdust piles, or compost heaps from midsummer to autumn. *Lepiota Morgani* (*Chlorophyllum molybdites*), a poisonous species resembling it in shape, has green spores, causing the lamellae to assume a green color as they mature.

Lepiota naucina (Fries) Quél. Edible

SMOOTH LEPIOTA

Pileus thick, globose to convex, five to eight centimeters broad; surface dry, usually white and smooth, at times slightly yellowish or granular on the disk; context firm, fleshy, white, mild; lamellae free, white, dull pinkish with age; spores usually white in mass, rarely tinged with pink; stipe white, smooth, enlarged below, bearing a white annulus above, six to ten centimeters long, eight to sixteen centimeters thick.

This excellent species occurs in the autumn in lawns and pastures where the common mushroom grows and is often picked and thrown away because the lamellae are white. There is no harm in using it for food if the collector and those who may imitate him distinguish it carefully from the white variety of *Venenarius phalloides*, which is so common in this region and

has been the cause of most of the deaths among mushroom eaters in the vicinity of New York City. It must be remembered that this deadly species is picked by some persons for the common mushroom, in spite of its white lamellae and bulbous stipe. How much more easily might *Lepiota naucina*, which has both characters, be confused with it! The deadly *Amanita phalloides* may be distinguished from *Lepiota naucina* by the "death-cup" at the base of the stipe, by the longer and usually more bulbous stipe, and by the gills remaining white instead of becoming slightly dull pinkish with age.

Chlorophyllum molybdites Mass. Poisonous

GREEN-SPORED LEPIOTA *Lepiota Morgani* Peck

Pileus fleshy, at first globose then convex and expanded or depressed, gregarious or in rings, ten to twenty centimeters broad; surface white beneath the cuticle, radiate-fibrillose, the cuticle at first continuous, buff to pale umber, soon broken up, except at the center, into irregular scales and patches, which are gradually drawn apart and at length are more or less deciduous; context thick, firm, white, changing to reddish when bruised, poisonous to some persons; lamellae rather broad, ventricose, close, remote from the stipe, at first white then changing to a greenish hue, at length dull green; spores in mass at first bright green, fading to dull green and becoming sordid with age, subellipsoid, obliquely apiculate, uniguttulate, 7–11 × 5–6 μ; stipe hard and firm, tapering upward from the thickened base, fistulose, fibrous-stuffed, the surface glabrous, white or buff to pale umber, ten to twenty centimeters long, one to two centimeters thick at the apex, two to four centimeters thick at the base; annulus thick, ample, soft, subcoriaceous, movable, apical.

Found in meadows, pastures, fields, and open woods from New Jersey to Iowa and southward to Texas, the West Indies, and

Brazil. It sometimes occurs in large fairy rings on lawns. It may be readily distinguished from *Lepiota americana* and other species of that genus by its green spores, which soon color the lamellae green. It is often eaten and is harmless to some persons, but distinctly poisonous to others, though never fatal. Old specimens appear to contain more poison than young ones.

Vaginata plumbea (Schaeff.) Murrill. Edible

Amanitopsis vaginata P. Karst.

SHEATHED AMANITA

Pileus thin, fragile, campanulate to expanded, three to eight centimeters broad; surface dry, glabrous, deeply striate on the margin, exceedingly variable in color, ranging from nearly white to reddish-brown; lamellae free, fragile, white; spores globose, smooth, hyaline, 8–10 μ; stipe nearly equal, scarcely enlarged below, glabrous or adorned with minute scales, variable in color, hollow or stuffed within, six to twelve centimeters long, four to eight millimeters thick, entirely devoid of a ring, but conspicuously sheathed at the base with a long, loose, white volva, portions of which are sometimes carried up as patches on the cap.

This attractive and very variable species is abundant in woods throughout Europe and North America during summer and autumn, and possesses excellent edible qualities. It may be distinguished from species of *Venenarius*, some of which are deadly poisonous, by the total absence of a ring on the stem, although the conspicuous volva at the base suggests its close relationship to that genus. The variations in color presented by this species are often very bewildering to the beginner, and it must be selected with great care to avoid confusing it with poisonous species.

Vaginata agglutinata (B. & C.) O. Kuntze. Poisonous. Fig. 41

Amanitopsis volvata (Peck) Sacc.

LARGE-SHEATHED VAGINATA

Pileus hemispheric to plane, sometimes slightly depressed, very variable in size, two to eight centimeters broad; surface dull white or yellowish, rarely reddish-brown at the center or entirely reddish-brown, pulverulent, floccose-squamose, or with large volval patches; lamellae free, rounded behind, broad, crowded, white; spores ellipsoid, smooth, hyaline, 10–12 × 6–7 μ; stipe very variable in size, one to seven centimeters long, three to eight millimeters thick, equal or tapering upward, enlarged at the base, whitish, minutely floccose-squamose, stuffed or solid; volva unusually large, firm, membranous, persistent, more or less lobed.

Found in open woods and wood borders from New England to Alabama and west to Ohio. It varies much in size and its surface may be entirely glabrous or adorned with a few large patches from the immense volva, or covered with powder. Ford says it is poisonous, and, even if it were edible, it is too much like poisonous species of *Venenarius* to be recommended.

VENENARIUS

The genus *Venenarius* is distinguished from all other white-spored genera by the presence of a universal veil which encloses the entire sporophore in its young stage and remains either at the base of the stipe or as warts on the surface of the pileus when the sporophore is mature. Nearly thirty American species are listed, and about half a dozen of these are known to be deadly poisonous.

Venenarius phalloides (Fries) Murrill. Deadly Poisonous. Fig. 32

Amanita phalloides Fries

DEADLY AMANITA DESTROYING ANGEL

Pileus convex or campanulate to expanded, three to fifteen centimeters broad; surface smooth, slightly viscid when moist,

glabrous or decorated with scattered patches of the volva, varying in color from pure white to yellow, yellowish-green, green, gray, brown, or blackish, margin rarely striate; context extremely poisonous, white, not objectionable to the taste but having at times a somewhat disagreeable odor; lamellae white, unchanging, broad, ventricose, rounded at the base and free or adnexed; spores globose, smooth, hyaline, 7–10 μ; stipe subequal, bulbous, long, smooth or floccose-scaly, usually white, stuffed or hollow, six to fifteen centimeters long, one-half to one and one-half centimeters thick; annulus superior, membranous, thin, ample, persistent or at times becoming torn away, usually white; volva white, adnate to the base of the large, rounded bulb, the limb usually free, conspicuous, lobed, thick and fleshy, persistent, but at times breaking partly or wholly into irregular patches that are either carried up on the surface of the pileus or remain at the base of the stipe.

This most deadly species, for which no antidote is known, occurs widely distributed in many forms and colors, but is always distinguished by the presence of a distinct volva or death-cup at the base of the stipe. The principal poison is not accurately known chemically, neither have its exact effects on the animal system been determined, although many attempts to do so have been made both by physiologists and chemists. It is reasonable to expect that at no very distant date an antidote will be discovered for the deadly amanita, as has been the case with rattlesnake poison and the toxin accompanying diphtheria. The effects of the poison are rather slow to appear, usually from six to fifteen hours, when there is sudden and severe pain in the abdomen followed by loss of strength and of flesh, and the patient gradually sinks into profound coma and dies in from three to eight days if the amount taken has been sufficient. Convulsions are not usual with this kind of poisoning.

It is frequently stated that poisons may be removed from

mushrooms by boiling them in water and throwing the water away. This may be true of some species, but it is by no means true of the deadly amanita. This species has only recently been subjected to severe tests with both dry heat and steam without disorganizing or extracting the poison from the substance of the cap.

The variety of colors assumed by this species—white, yellow, green, gray, brown, blackish—and the fact that the annulus and the limb of the volva may sometimes be lost, make it necessary to use great caution in selecting any white-gilled species with bulbous stipe for food, whether an annulus is present or not. All species of *Venenarius* and *Vaginata*, and several species of *Lepiota*, must be examined with great care.

Venenarius muscarius (L.) Earle. Deadly Poisonous. Fig. 35

Amanita muscaria (L.) Pers.

FLY AMANITA FLY AGARIC FLY POISON

Pileus globose to convex, at length nearly plane, eight to twenty centimeters broad; surface slightly viscid when fresh, red or orange to yellow, rarely paler, adorned with numerous whitish or yellowish warts, margin slightly striate; context white, yellow under the pellicle, extremely poisonous; lamellae white, rarely pale yellowish, rather broad, reaching the stipe and forming slight decurrent lines upon it; spores subglobose to ellipsoid, 9–10 × 7–8 μ; stipe subequal, white or pale yellowish, stuffed or hollow, usually rough with concentric, margined scales adnate to the bulbous base, eight to twenty-five centimeters long, two to three centimeters thick; annulus superior, large, membranous, persistent, white; volva white or yellowish, usually entirely fragile, rarely slightly margining the bulb.

Widely distributed in woods, wood borders, and thickets throughout temperate regions, being especially abundant under and near pine trees. It is a strikingly beautiful plant and all

the more dangerous because of its beauty. Its colors are usually paler here than in Europe. Italians have often mistaken it for the royal agaric, and it is even picked at times by the ignorant for *Agaricus campester*. The volva usually breaks up very early, so that a definite cup is rarely seen at the base of the stipe, but the fragments of the volva are conspicuous on the surface of the pileus.

This species has been celebrated for centuries on account of its poisonous properties due to the alkaloid muscarine, which affects the ganglia controlling the nerves of the heart and thus retards and finally stops its action if taken in sufficient quantity. Atropine has the opposite effect on the heart, and has therefore been successfully used as an antidote for muscarine. Other heart stimulants have also been used. The effects of the poison are slow to appear unless taken in quantity. Convulsions are often among the symptoms. Atropine should be administered by the attending physician as quickly as possible. The literature of this species is more extensive than that of all other poisonous species combined. It was formerly widely used as a fly poison; and is still used in certain parts of Russia as an exhilarant. It is celebrated in history because of its long and distinguished list of victims. It has been chemically investigated more often and more successfully than any other species, and a perfect antidote for its principal poison has been discovered.

Venenarius cothurnatus (Atk.) Murrill. Poisonous. Fig. 38

Amanita cothurnata Atk.

BOOTED AMANITA

Pileus globose to convex, at length expanded, three to seven centimeters broad; surface quite viscid when moist, decorated with small, scattered, soft, floccose warts, white or tinged with

lemon-yellow, or with the center tawny-olive, even or finely striate on the margin; context white, without odor; lamellae rounded behind, crowded, plane, white; spores globose, smooth, hyaline, 7–9 μ; stipe cylindric, bulbous, flocculose or floccose-scaly, white, hollow or rarely stuffed, five to twelve centimeters long, two-fifths to one centimeter thick; annulus white, thick, persistent, volva white, adnate to the large, ovoid bulb, circumscissile, breaking uniformly and leaving an abrupt ring at the top of the bulb.

Found in woods from New York to Alabama and west to Pennsylvania and Tennessee. I have noticed that it has the same effect upon flies as *V. muscarius*. Its close relative, *Venenarius pantherinus*, is considered poisonous by all authors, causing intoxication similar to that caused by *V. muscarius*, though in milder form, and containing both muscarine and choline. It is said to be the chief poisonous mushroom of Japan, but has been rarely known to be fatal.

Venenarius spretus (Peck) Murrill. Poisonous

Amanita spreta Peck

Sheathed Venenarius

Pileus subovoid to convex, at length expanded, seven to twelve centimeters broad; surface white or pale grayish-brown, subviscid, glabrous or with few volval fragments, faintly striate on the margin; lamellae adnexed, subcrowded, rather narrow, white; spores ellipsoid, smooth, hyaline, 10–12 × 6–8 μ; stipe cylindric, equal, not bulbous at the base, smooth, nearly glabrous, slightly pruinose at the apex, white, solid or stuffed, seven to ten centimeters long, about one and one-half centimeters thick; annulus membranous, persistent, white, attached about one to two centimeters from the apex of the stipe; volva thin, membranous, ample, persistent, closely sheathing but not adnate.

Found sparingly in open or bushy places from Maine to Alabama in the eastern United States. This species is poisonous,

according to Ford, and it must be remembered when collecting *Vaginata plumbea* for food, since the sheaths in the two species are very similar.

Venenarius solitarius (Bull.) Murrill. Poisonous. Fig. 31

Amanita solitaria Fries, *Amanita strobiliformis* Vitt.

WARTED AMANITA PINE-CONE AMANITA

Pileus subglobose or convex to plane, solitary, five to twenty centimeters broad; surface dry, usually white or slightly yellowish, rarely cinereous or murinous, densely pulverulent, or pelliculose adorned with seceding, angular warts that may be soft, floccose, and flattened, or firm and erect, often becoming glabrous with age, margin smooth, at times appendiculate; context firm, white, usually of mawkish flavor and odor resembling that of chlorine; lamellae usually adnexed and rather narrow, occasionally free and rounded behind, more or less crowded, white; spores ellipsoid, smooth, hyaline, very variable in size, 7–14 × 5–9 μ; stipe subequal, usually radicate, bulbous or enlarged or equal below, concolorous or paler, mealy above, squamulose or imbricate-squamose below, solid or slightly spongy, four to fifteen centimeters long, one to four centimeters thick; annulus white, apical, fragile or lacerate, often appendiculate or evanescent; volva white, usually friable, rarely remaining as concentric, margined scales or a short limb at the base of the stipe.

An exceedingly variable species, usually white and scaly and often with a chlorine odor, occurring in the open or in thin woods throughout most of the United States. It has been considered edible, but Ford finds that it contains a small quantity of the deadly amanita-toxin found in *Venenarius phalloides* and it should therefore never be eaten.

Venenarius rubens (Scop.) Murrill. Edible

Amanita rubescens Pers.

BLUSHING AMANITA

Pileus ovoid to convex, at length expanded, six to twelve centimeters broad; surface adorned with numerous thin, floccose or farinose warts, variable in color, always tinged with reddish or brownish-red, changing slowly to reddish when bruised, margin smooth or faintly striate; context white, changing slowly to reddish when bruised, with a pleasant odor and taste; lamellae free or slightly adnexed, crowded, nearly plane, white, characteristically chalky-white when dry; spores ellipsoid, smooth, hyaline, 10–11 × 6–7 μ; stipe equal or slightly tapering upward, usually bulbous, squamulose, whitish suffused with red, becoming reddish when bruised, stuffed, six to twenty centimeters long, six to twelve millimeters thick; annulus superior, ample, white, easily torn; volva very fragile, most of the fragments appearing on the surface of the pileus, while a few remain clinging to the margin of the bulb.

Found commonly in woods and groves from Maine to Alabama and west to Ohio. It contains poisons when raw, but these are disorganized by cooking or digestion. Although edible, I cannot advise any one to eat it, since many of its near relatives are so deadly. It might easily be confused with *Venenarius muscarius*, for example.

Venenarius Caesareus (Scop.) Murrill. Edible

Amanita Caesarea Pers.

CAESAR'S AGARIC ROYAL AGARIC

Pileus hemispheric to expanded, eight to sixteen centimeters broad; surface red, orange, or yellow, rarely pale yellow, smooth, shining, occasionally decorated with a patch from the volva, margin thin, deeply striate; context yellow, unchanging, mild and agreeable to the taste, odor none; lamellae free, subcrowded,

bright yellow; spores ellipsoid, smooth, hyaline, 8–10 × 6 μ; stipe cylindric or subventricose, not bulbous at the base, white or pale yellow, slightly flocculose, stuffed, ten to sixteen centimeters long, one to two centimeters thick; annulus ample, white or pale yellow, apical; volva large, membranous, tough, white, forming a wide, free cup with lobed or toothed margin.

Found in woods throughout the eastern United States, especially in Virginia and southward. It is said that the earlier Italian immigrants often confused this species with *Venenarius muscarius*, with fatal results. The expert would notice at once the large white volva, the yellow lamellae, and the differently colored pileus; but my advice, even to experts, is to *avoid all species* of *Venenarius* when selecting fungi for food.

Pleuropus abortivus (Berk. & Curt.) Murrill. Edible

Clitopilus abortivus (Berk. & Curt.) Sacc.

ABORTIVE PLEUROPUS

Pileus of developed form fleshy, firm, convex to nearly plane or slightly depressed, usually entire on the margin, gregarious or cespitose, five to ten centimeters broad, the sporophores very commonly represented by subglobose aborted masses of cellular tissue three to six centimeters in diameter; surface of developed form dry, silky-tomentose, becoming glabrous, gray or grayish-brown; context white, with farinaceous odor and taste; lamellae adnate, close, thin, strongly decurrent, whitish or pale grayish, changing to salmon-colored; spores angular, uninucleate, salmon-colored, 8.5–10 × 6–7 μ; stipe subequal, solid, slightly flocculose, longitudinally striate, concolorous or paler than the pileus, three and one-half to eight centimeters long, five to twelve millimeters thick.

Common on rich earth or much decayed wood in woods during late summer and autumn, from Canada to Alabama and west to Wisconsin and Mexico. It is very abundant about New York

City, both in its fully developed and aborted forms, and I have seen the latter on sale in Mexican markets. The flavor is very poor, in my opinion, but some special method of cooking may be found to improve it. One must not confuse it with poisonous species of *Entoloma*, nor with the "eggs" of certain phalloids. Similar aborted forms are frequently found in *Armillaria putrida*, an edible species.

Two relatives of this species, unfortunately not common in this region, are considered delicious. The plum mushroom, *Pleuropus prunulus*, is five to ten centimeters broad, whitish or grayish above and pinkish below, occurring in rich woods. The sweet-bread mushroom, *Pleuropus Orcella*, occurs in more open places, and is smaller and more irregular but with the same mealy odor and taste. None of the species of this genus, with pinkish, decurrent lamellae, are known to be poisonous.

Pluteus cervinus (Schaeff.) Fries. Edible

FAWN-COLORED PLUTEUS

Pileus rather thin and fragile, bell-shaped to expanded, six to ten centimeters broad; surface smooth or slightly radiate-fibrillose, avellaneous to subfuliginous, rarely white, sometimes streaked; context white, almost tasteless; lamellae free, broad, white when young, becoming salmon-pink; spores broadly ellipsoid, smooth, flesh-colored, 6–8 × 5–6 μ; cystidia ellipsoid, stout, thick-walled, hyaline, forked at the tip; stipe equal or enlarged at the base, white above, more like the cap below, usually glabrous, nearly solid, brittle, eight to fifteen centimeters long.

This species occurs quite commonly in open woods about stumps and on decaying wood of various kinds from June to November. It is of poor quality, and must be carefully distinguished from poisonous species of *Entoloma*.

Paxillus involutus (Batsch) Fries. Edible. Fig. 7

INVOLUTE PAXILLUS

Pileus convex to expanded or depressed, four to eight centimeters broad; surface variable in color, grayish, yellowish-brown, or reddish-brown, margin downy and inrolled when young; context yellowish, becoming brownish when bruised; lamellae decurrent, reticulate on the stipe, pallid to greenish-yellow, changing to brown when bruised; spores ovoid, 7–9 × 4–5 μ; stipe central or eccentric, short, equal, concolorous, three to five centimeters long, one to two centimeters thick.

This species is widely distributed, occurring in late summer and autumn on open ground or on dead logs and stumps in woods. In England and in Oregon, where the climate is moist, I have seen much larger specimens than in the eastern United States. Farther south, *Paxillus rhodoxanthus*, another excellent edible species, with tomentose, reddish-brown pileus and yellow lamellae, is very common on clay banks along roadsides.

Inocybe infida (Peck) Earle. Poisonous. Fig. 39

UNSAFE INOCYBE

Pileus ovoid to campanulate, at length expanded, umbonate, gregarious, one and one-half to three centimeters broad; surface silky-scaly, shining, light tawny-brown, sometimes paler, dark reddish-brown on the umbo, often splitting at the margin; lamellae free, crowded, pale yellowish to grayish-cinnamon; spores ovoid, irregular, nodulose, yellowish-brown, 10–11 × 6–7 μ; stipe subequal, concolorous, pruinose, scurfy above, three to five centimeters long, two to four millimeters thick; veil white, evanescent, clinging in delicate threads to the stipe and the margin of the young pileus.

This species occurs abundantly every summer and fall on the lawns of the New York Botanical Garden, and has been carefully studied. It is like *Venenarius muscarius* in its poisonous effects.

Inocybe infelix, *Inocybe decipiens*, and *Inocybe rimosa* are also considered poisonous. These latter are mostly small, wood-loving plants, but *I. infida* grows where *Marasmius oreades* does and must be carefully avoided. Species of the related genus *Hebeloma* should also be avoided until better known.

Pholiota candicans (Bull.) Schröt. Edible. Fig. 12

Pholiota praecox (Pers.) Quél.

EARLY PHOLIOTA

Pileus fleshy, convex to plane, at times umbonate, solitary or gregarious, three to seven centimeters broad; surface smooth or pitted, glabrous, moist, whitish, cream-colored or isabelline, the center often darker; lamellae adnexed, crowded, white, becoming fulvous; spores ellipsoid, smooth, ferruginous, 7–8 × 5 μ; stipe subconcolorous, equal, glabrous, four to eight centimeters long, three to five millimeters thick; veil large, white, forming a conspicuous and permanent annulus near the apex of the stipe.

This is one of our best edible species, and it occurs quite abundantly during spring and summer in grassy and open places throughout temperate regions. *Pholiota autumnalis*, recently found to contain a powerful poison of unknown composition, occurs later in the season. Most of the ocher-spored gill-fungi that have been tested are harmless.

Hypholoma appendiculatum (Bull.) Quél. Edible. Fig. 20

APPENDICULATE HYPHOLOMA

Pileus fleshy, fragile, thin, convex to expanded, cespitose or gregarious, two to six centimeters broad; surface glabrous or whitish-pulverulent, rarely floccose-scaly, usually cracking with age, hygrophanous, varying in color from pale-yellowish to light brown or dark honey-yellow, fading when old or dry; lamellae adnate, close, narrow, white or creamy-white to purplish-brown;

spores ovoid, smooth, purplish-brown, $7 \times 4\ \mu$; stipe slender, equal, hollow, white, glabrous below, pruinose at the apex, five to seven centimeters long, four to six millimeters thick; veil white, delicate, evanescent, clinging to the margin of young plants as shred-like appendages.

This is everywhere recognized as one of the best and most dainty edible species. It is very widely distributed and grows in abundance throughout the season about dead wood or in soil rich in decayed wood.

Hypholoma perplexum (Peck) Sacc. Edible. Fig. 19

PERPLEXING HYPHOLOMA

Pileus convex to nearly plane, cespitose, slightly umbonate at times, five to eight centimeters broad; surface smooth, glabrous, dry, latericeous to bay, the margin cream-colored to ochraceous; context usually of mild flavor, sometimes bitter, white or nearly so, becoming yellowish with age; lamellae adnate, somewhat rounded, sometimes slightly greenish, and finally purplish-brown, $7–8 \times 4\ \mu$; stipe subequal, firm, hollow, slightly fibrillose, stramineous above, ochraceous or reddish below, six to ten centimeters long, five to seven millimeters thick, ornamented with an arachnoid annulus when young, which becomes conspicuous by reason of the spores which collect upon it.

This species occurs abundantly on stumps and roots of deciduous trees in autumn, appearing in conspicuous reddish clusters of considerable size. It is edible, but not very good in quality, being useful because of its late appearance. Peck separated it from *H. sublateritium* chiefly because it usually lacks the bitter taste ascribed to that species, of which it may be only a form. In collecting this species for food, young and fresh specimens of mild flavor should be selected, and they should be cooked for at least thirty minutes. Soaking in water with a little vinegar for twenty minutes before cooking improves the flavor.

Agaricus campester L. Edible. Fig. 11

COMMON MUSHROOM PASTURE MUSHROOM

Pileus convex to expanded, 5–9 cm. broad; surface dry, silky, and whitish, or floccose-squamulose and light reddish-brown, the color being chiefly in the scales; context white, thick, solid, of mild flavor, sometimes becoming reddish when broken; lamellae free, rounded behind, ventricose, crowded, white when young, becoming salmon-pink, and finally brown or blackish; spores ellipsoid, smooth, dark brown, 10–12 μ long; annulus delicate, inconspicuous, formed from a thin, white veil, which covers the lamellae in their younger stages; stipe smooth, white, cylindric, nearly equal, stuffed within, three to six centimeters long, one and one-half to two centimeters thick.

The common mushroom occurs in low grass in meadows or on rich, moist, upland pastures, being common after rains from August to October in this latitude. The "spawn," or vegetative portion, is hidden in the soil and feeds upon the dead organic matter found therein. In the cultivation of this species, bricks of spawn are planted in suitable soil and the conditions of growth attended to with great care. This is the mushroom usually found in market, either in the fresh stage or in cans. Most persons who collect fungi for food in the fields limit themselves to this one species. Great care must be taken not to get young plants of the deadly amanita when collecting "buttons" of the common mushroom at the edge of woodlands. Also see *Panaeolus venenosus*, which may appear in mushroom beds.

Agaricus placomyces Peck. Edible

FLAT-CAP MUSHROOM

Pileus rather thin, convex to plane, solitary, five to twelve centimeters broad; surface whitish or grayish, adorned with small brown scales, darker at the center and usually becoming

brownish over the whole surface with age; lamellae white, then pink, and finally blackish-brown; spores brown, 5–8 × 3–4 μ; stipe long, slender, whitish or slightly yellowish, bulbous at the base, five to ten centimeters long, five to seven millimeters thick; annulus superior, somewhat double and radially cleft.

This species resembles the common pasture mushroom, but has a longer stipe and grows in thin woods or wood borders. It is excellent, but unfortunately not common.

Agaricus arvensis Schaeff. Edible. Fig. 27

HORSE MUSHROOM FIELD MUSHROOM

Pileus large, convex, six to fifteen centimeters broad; surface white, becoming yellowish with age or on drying; context white, thick, highly flavored, and easily digested; lamellae white to pale pinkish at first, at length brown; stipe long, white, often enlarged at the base, five to ten centimeters long, eight to sixteen millimeters thick; annulus of two parts, membranous and white above, radiately split and tinged with yellow below.

This species grows in rich soil in pastures, fields, and wood borders from midsummer to early fall. It resembles the common mushroom, but is larger, with longer stipe, paler lamellae, and a peculiar double annulus. I have often eaten it in Sweden and found it delicious. A slender wood-loving edible species, *Agaricus silvicola*, can hardly be distinguished from it.

PANAEOLUS

Species of this genus usually occur in manure or rich soil in open places. *P. papilionaceus* and *P. retirugis* are said to produce hilarity and a mild form of intoxication in man if eaten in quantity. Ford found the latter species poisonous to guinea pigs. A century ago, *P. campanulatus* was reported poisonous, inducing sleep. MacIlvaine has tried it in small quantities without harmful results.

Panaeolus venenosus Murrill. Poisonous

POISONOUS PANAEOLUS

Pileus thick, fleshy, hemispheric when very young, then hat-shaped, and at length expanded, cespitose, 3–5 cm. broad; surface moist, slightly viscid when very young, hygrophanous, bay becoming fulvous or isabelline according to age and moisture conditions, glabrous, smooth on the umbo, rugose and folded on the broad rim when in the hat-like stage; margin entire to lobed, not projecting, smooth, entirely free from fibrils or remnants of a veil, incurved when young, marked with a water-soaked, dark-fulvous zone about 3 mm. broad; context white or slightly yellowish, very thick at the center and very thin toward the margin, the odor and taste resembling that of the common mushroom; lamellae squarely adnate, without sinus or decurrent tooth, plane, somewhat semicircular in shape, at least when young, inserted, fuliginous, gray or whitish on the edges, not distinctly marbled, purplish-fuliginous when viewed from below, of medium distance, about 8 mm. broad; spores broadly ellipsoid or ovoid, somewhat pointed or narrowed at both ends, black, smooth, opaque, 11–13 × 7–8.5 μ; cystidia not found; stipe thick, fleshy, sometimes equal but usually much enlarged upward, whitish or rosy-isabelline, not polished, longitudinally striate at the apex, whitish-pruinose above, whitish-tomentose below, conspicuously hollow, 6–10 cm. long, 5–10 mm. thick.

This species was brought to me for critical examination on May 1, 1916, by Mrs. Rufus Hatch, of Pelham Manor, New York. It grew plentifully in her mushroom beds the past winter, almost to the exclusion of the common cultivated mushroom, and was eaten by Mrs. Hatch and four members of her household with nearly fatal results. At first sight, the specimens suggested the genus *Psilocybe*, since the gills were purplish-brown and the margin did not project beyond them; but the spore-print proved to be black and the spores typically those of the genus *Panaeolus*. The species is aberrant and might be

placed in a different group or subgroup with species like *Panaeolus digressus* Peck and *Panaeolus acidus* Sumstine. Other species of *Panaeolus* have been considered somewhat poisonous, but apparently none have exhibited such poisonous properties as this.

The public is hereby warned against any mushrooms appearing in mushroom beds except the common cultivated species with white cap and pink gills, Agaricus campester.

Coprinus

The "ink-caps" are abundant and excellent, and it is almost impossible to confuse them with poisonous species on account of the peculiar way they have of melting into a black fluid when mature. The species of *Panaeolus* do not deliquesce. The three species here described would constitute an important addition to our food supply if more generally used. They are very tender and very digestible, but are perishable and should be cooked promptly.

Coprinus micaceus (Bull.) Fries. Edible. Fig. 22

Glistening Ink-cap

Pileus thin, ovoid to campanulate, cespitose, one and one-half to two and one-half centimeters in diameter, soon expanding and becoming discolored; surface striate, tawny-yellow or tan, yellowish-orange on the umbo, usually covered with minute, glistening scales when young; context thin, white, of nutty flavor, quickly deliquescing in wet weather; lamellae white when young, soon becoming purplish-brown and finally black; spores ellipsoid, dark brown, 6–7 μ, stipe white, slender, fragile, hollow, three to ten centimeters long.

The glistening ink-cap grows abundantly in dense clusters about stumps and dead trunks, especially of elm, and appears

very early in the season, developing after rains from April to November. It is of small size, but delicate in flavor and easily prepared in a variety of ways. The plants should be gathered young and cooked within a few hours.

Coprinus atramentarius (Bull.) Fries. Edible. Fig. 14

COMMON INK-CAP

Pileus ovoid to campanulate, finally expanding and deliquescing, densely cespitose, three to six centimeters broad; surface glabrous or slightly scaly, especially on the disk, grayish or brownish, often with a yellowish tint, blackening with age; context white, quickly deliquescing; lamellae crowded, white when young, soon becoming black and dissolving; spores ellipsoid, black, 7–10 μ; annulus sometimes apparent near the base of the stipe as an indistinct line; stipe slender, smooth, white, hollow, five to ten centimeters long.

This excellent edible species is quite common in rich soil on lawns and elsewhere during late summer and autumn. As it appears in close clusters, it may usually be obtained in greater abundance than the shaggy-mane. Owing to its deliquescent character, it must be cooked very soon after it is collected.

Coprinus comatus (Muell.) Fries. Edible. Fig. 13

SHAGGY-MANE HORSETAIL

Pileus at first oblong, subcylindric, expanding and deliquescing with age, four to six centimeters in diameter; surface shaggy, white, with yellowish or brownish scales, tinged with lilac in places, grayish-black on the margin, blackening with age; context white, tender, of nutty flavor; lamellae crowded, white when young, soon changing to pink, then to black, and finally melting away into an inky fluid; spores ellipsoid, black, 13–16 μ; annulus white, small, movable or slightly adhering, often falling away at an early stage; stipe slender, smooth, white, hollow, seven to twelve centimeters long.

The shaggy-mane is a very conspicuous object on lawns in autumn, although it is not always so abundant as might be desired. On account of its peculiar shape and decided colors, a single specimen rarely fails to attract attention. It is considered one of the very best and most digestible of the fungi, and is often eaten raw by foreigners. At times, this species occurs in enormous quantities in rich, loose earth by roadsides or in weedy places, and it then becomes an important source of food supply. It requires little cooking, and is best broiled and seasoned simply.

Puffballs

Puffballs are the safest of all fungi for the beginner in mycophagy, none of them being poisonous; and they are at the same time excellent and easy to obtain. Being tender, they cook quickly and are easily digested. They should as a rule be cut open before cooking to see that they are not too old and that they are really puffballs. If they are white and firm like cream cheese inside, showing no yellow or brownish discoloration, they are of the right age to use. If the interior shows no special structures, but is smooth and homogeneous, then one may be sure he has a puffball. The "egg" of the deadly amanita contains the young cap and stem inside, which is readily seen when the "egg" is cut; and the "egg" of the stinkhorn shows the stem and a green mass inside surrounded by a layer of jelly-like substance. Both of these "eggs" are shown on the chart.

Puffballs may be cooked alone in various ways, or used in stews and omelets, and for stuffing roast fowls. When used in omelets, they should be stewed first. All kinds except the very small ones should first be peeled and cut into slices or cubes, after which they may be fried quickly in butter, or dipped in beaten egg and fried like egg-plant, or cooked in any of the ways

recommended for the ordinary mushroom. The smaller kinds are much inferior in flavor to the larger ones and need a few specimens of some good mushroom to make them attractive.

Lycoperdon gemmatum Batsch. Edible

STUDDED PUFFBALL

Peridium turbinate, subumbonate, usually whitish or gray, two to four centimeters in diameter, narrowed below into a short, stem-like base; cortex of long, erect spines or warts of irregular shape scattered among small granular and more persistent ones, all of which finally fall away, leaving the surface reticulate with fine dotted lines; capillitium and spores greenish-yellow, at length pale brown, columella present; spores globose, smooth or slightly roughened, about 4 μ in diameter.

This is a very common species, growing usually on the ground in woods. Although extremely variable, it is recognized without much difficulty by the character of its spiny covering, the larger spines somewhat resembling the shape of cut gems. The plants generally grow near together and are occasionally cespitose, but are rarely so crowded as in the case of the pear-shaped puffball, *Lycoperdon pyriforme*, a small species of poor quality occurring in great abundance on decaying wood or sawdust.

Lycoperdon cyathiforme Bosc. Edible. Fig. 26

LARGE FIELD PUFFBALL COMMON PASTURE PUFFBALL

Peridium large, subglobose to turbinate, five to fifteen centimeters in diameter, the base short and thick; surface smooth, glabrous or finely floccose, whitish-gray or brown, becoming purplish and rimose-areolate above with age, cuticle thin, easily separating; capillitium and spores purplish-brown, falling away in age with the upper part of the peridium, leaving a persistent cup-shaped base with a ragged margin; spores sessile, globose, distinctly echinulate, purplish-brown, 5–7 μ in diameter.

This puffball occurs commonly in the eastern United States in meadows and pastures where the common mushroom may be expected to grow, but its excellent qualities appear to be unknown to most persons. It is the largest puffball in this region except the giant puffball, which is much rarer. Bosc originally described it from the cup-shaped sterile base, hence the specific name is hardly appropriate. It sometimes grows in circles, and it has been known to be so abundant as to seriously injure lawns.

The giant puffball, *Lycoperdon giganteum*, may be readily recognized by its large size, usually about the size of a man's head, and its smooth, white appearance. It occurs infrequently in fields, pastures, or woods throughout most of the United States.

Scleroderma aurantium (L.) Pers. Inedible

COMMON SCLERODERMA HARD-SKINNED PUFFBALL

Peridium depressed-globose, subsessile, radicate, often cespitose, two and one-half to eight centimeters in diameter, thick, corky, usually pale with yellow shades, or orange, sometimes brown, mostly covered with large warts; gleba at first white, then vinaceous to bluish-black, finally greenish-gray, lines of trama whitish; spores dark, globose, warted, 7–12 μ.

A very common and widely distributed species growing in dry woods, especially under chestnut trees. I have eaten the young sporophores, but do not consider them attractive. Persons have brought them to me thinking they were truffles. This and related species were formerly considered poisonous but are now believed to be harmless, although not desirable for food. They may be readily distinguished from the true puffballs by their black interior and hard skin.

Phalloids

Remarkably little is definitely known regarding the properties of the phalloids, the only suspected group of the Gasteromycetes. It seems that the strong and disagreeable odor of many of these plants has discouraged experimentation in this line, and certainly no one would use them for food unless by mistake. *Phallus impudicus*, *Dictyophora duplicata*, *Clathrus cancellatus*, and other species have been usually considered poisonous. MacIlvaine has tested the "eggs" of a few species and considers them harmless, while mature specimens are said to be uniformly fatal to swine. If the "eggs" of all species should be found to be harmless, the danger of confusing puffballs with poisonous fungi would be reduced to distinguishing the undeveloped stages of species of *Venenarius*, which on sectioning show the tiny pileus and stipe within the membranous wrapper.

Dictyophora duplicata (Bosc) Ed. Fisch. Considered Poisonous
Fig. 34

Veiled Stinkhorn

Pileus campanulate, five centimeters long, the surface appearing strongly reticulate-pitted after the fetid, olivaceous gleba has been devoured by flies or washed away by rains; apex truncate, perforate; spores oblong-ellipsoid, $4 \times 2\ \mu$, involved in mucus at maturity; stipe fusiform-cylindric, tapering at each end, cellular-spongy, white, hollow, ten to twenty centimeters high, two and one-half to three centimeters thick; veil white, reticulate, variable in length, sometimes much expanded, always conspicuous, fragile; volva globose, nearly white, very poisonous, five to seven centimeters in diameter.

This very conspicuous and objectionable species occurs in the United States about buildings and near stumps in fields and in the edges of woods. It may be easily recognized by its con-

spicuous veil, which is attached near the apex beneath the pileus and hangs down to the middle of the stipe or lower. The mature gleba is extremely fetid, proving attractive to flies, which probably disseminate the spores. A similar species, *D. Ravenelii*, possessing similar properties, occurs in abundance in old sawdust piles and about rotting logs and stumps in woods and fields in the eastern United States and Canada. It may be readily distinguished from the veiled stinkhorn by the absence of a conspicuous, reticulate veil; its cap is also smooth instead of coarsely pitted, and its odor is less disagreeable.

Glossary

Adnate, attached squarely to the stipe.
Adnexed, attached slightly to the stipe.
Annulus, the ring or collar on the stipe.
Appendiculate, hanging in small fragments to the margin.
Avellaneous, drab.
Bulbous, with a bulb-like swelling at the base.
Cespitose, clustered.
Circumscissile, splitting transversely at the middle.
Context, the substance of the pileus.
Decurrent, extending downward on the stipe.
Dimidiate, semicircular or nearly so.
Disk, the central part of the surface of the pileus.
Distant, said of lamellae when they are far apart.
Eccentric, not centrally attached.
Echinulate, minutely spiny.
Equal, said of the stipe when of uniform thickness.
Floccose, clothed with hairs.
Free, not attached to or not reaching the stipe.
Fuliginous, sooty or dark brown.
Fulvous, tawny.
Fumosous, smoky.
Furfuraceous, clothed with numerous minute scales.
Glabrous, devoid of hairs or scales.
Gleba, the spore-bearing tissue of puffballs and their allies.

Gregarious, growing in groups.
Hygrophanous, as though water-soaked.
Hymenium, the fruiting surface or layer.
Hymenophore, the fruit-body.
Imbricate, overlapping like tiles on a roof.
Involute, rolled inward.
Isabelline, light leather-colored.
Lamellae, the gills of a mushroom.
Latericeous, brick-colored.
Luteous, egg-yellow.
Melleous, honey-yellow.
Miniatous, scarlet.
Murinous, mouse-colored.
Mycelium, the vegetative part of a fungus, made up of delicate threads.
Ochraceous, ocher-yellow.
Ochroleucous, yellowish-white.
Ocreate, fitting like a stocking or boot.
Peridium, the wall of puffballs.
Pileus, the cap of a mushroom.
Pulverulent, covered with powder or dust.
Reticulate, net-like or marked with net-like lines.
Sinuate, notched where they join the stipe.
Sporophore, the fruit-body, or part bearing the spores.
Squamose, scaly.
Stipe, the stem.
Superior, said of the annulus when near the apex of the stipe.
Testaceous, pale brick-colored.
Tomentose, clothed with dense, matted hairs.
Umbilicate, slightly and abruptly depressed at the center.
Umbo, an elevation at the center of the pileus.
Veil, a membrane at first covering the gills, at length forming the ring.
Ventricose, enlarged at the middle.
Virgate, streaked.

Volva, a membrane covering the entire fruit-body when young, at length forming a cup at the base of the stipe or distributed in fragments over the surface of the pileus or stipe.

SPECIES FIGURED ON THE CHART

Edible Mushrooms

1. Ceriomyces crassus Batt. (Edible Boletus)
2. Ceriomyces scaber (Bull.) Murrill (Rough-stemmed Boletus)
3. Gyroporus castaneus (Bull.) Quél. (Chestnut-colored Boletus)
4. Russula Mariae Peck (Mary's Russula)
5. Rostkovites granulatus (L.) P. Karst. (Granulated Boletus)
6. Chanterel Chantarellus (L.) Murrill (Edible Chanterel)
7. Paxillus involutus (Batsch) Fries (Involute Paxillus)
8. Lepista personata (Fries) W. G. Sm. (Masked Tricholoma)
9. Crepidopus ostreatus (Jacq.) S. F. Gray (Oyster Mushroom)
10. Boletus luteus L. (Egg-yellow Boletus)
11. Agaricus campester L. (Common Mushroom)
12. Pholiota candicans (Bull.) Schröt. (Early Pholiota)
13. Coprinus comatus (Müll.) Fries (Shaggy-mane)
14. Coprinus atramentarius (Bull.) Fries (Common Ink-cap)
15. Fistulina hepatica (Huds.) Fries (Beefsteak Mushroom)
16. Lactaria deliciosa (L.) Fries (Delicious Lactaria)
17. Lactaria hygrophoroides B. & C. (Distant-gilled Lactaria)
18. Russula flava Romell (Yellow Russula)
19. Hypholoma perplexum (Peck) Sacc. (Perplexing Hypholoma)
20. Hypholoma appendiculatum (Bull.) Quél. (Appendiculate Hypholoma)
21. Strobilomyces strobilaceus (Scop.) Berk. (Pine-cone Boletus)
22. Coprinus micaceus (Bull.) Fries (Glistening Ink-cap)
23. Morchella esculenta Pers. (Common Morel)
24. Clavaria flava Schaeff. (Pale-yellow Clavaria)
25. Clitocybe multiceps Peck (Many-headed Clitocybe)
26. Lycoperdon cyathiforme Bosc (Field Puffball)
27. Agaricus arvensis Schaeff. (Horse Mushroom)
28. Armillaria putrida (Scop.) Murrill (Honey Agaric)
29. Marasmius oreades (Bolt.) Fries (Fairy-ring Mushroom)
30. Laetiporus speciosus (Batt.) Murrill (Sulphur-colored Polypore)

Poisonous Mushrooms

31. Venenarius solitarius (Bull.) Murrill (Pine-cone Amanita)
32. Venenarius phalloides (Fries) Murrill (Deadly Amanita)
33. Monadelphus illudens (Schw.) Earle (Deceiving Clitocybe)
34. Dictyophora duplicata (Bosc) Ed. Fisch. (Veiled Stinkhorn)
35. Venenarius muscarius (L.) Earle (Fly Amanita)

36. **Lactaria rufa** (Scop.) Fries (BAY-RED LACTARIA)
37. **Gymnopus carnosus** (Sow.) Murrill (SPOTTED COLLYBIA)
38. **Venenarius cothurnatus** (Atk.) Murrill (BOOTED AMANITA)
39. **Inocybe infida** (Peck) Earle (UNSAFE INOCYBE)
40. **Panellus stypticus** (Bull.) P. Karst. (ASTRINGENT PANUS)
41. **Vaginata agglutinata** (B. & C.) Kuntze (LARGE-SHEATHED VAGINATA)
42. **Suillellus luridus** (Schaeff.) Murrill (LURID BOLETUS)
43. **Tylopilus felleus** (Bull.) P. Karst. (BITTER BOLETUS)
44. **Russula emetica** Fries (EMETIC RUSSULA)
45. **Russula foetens** Pers. (FETID RUSSULA)
46. **Clitocybe sudorifica** Peck (SWEAT-PRODUCING CLITOCYBE)
47. **Chanterel aurantiacus** (Wulf.) Fries (FALSE CHANTEREL)

PECK'S LIST OF EDIBLE MUSHROOMS

Dr. Charles H. Peck, former state botanist of New York, studied fungi fifty years. The following list comprises species definitely stated by him to be edible. His nomenclature is slightly different from mine in some groups.

Agaricus abruptus Pk.
Agaricus arvensis Schaeff.
Agaricus campester L.
Agaricus diminutivus Pk.
Agaricus haemorrhoidarius Schulz.
Agaricus micromegethus Pk.
Agaricus placomyces Pk.
Agaricus rodmani Pk.
Agaricus silvicola Pk.
Agaricus subrufescens Pk.
Amanita caesarea Scop.
Amanita rubescens Fr.
Amanitopsis strangulata (Fr.) Roze
Amanitopsis vaginata Roze
Armillaria mellea Vahl
Boletinus grisellus Pk.
Boletinus pictus Pk.
Boletus affinis Pk.
Boletus albidipes Pk.
Boletus albus Pk.
Boletus bicolor Pk.
Boletus brevipes Pk.
Boletus castaneus Bull.
Boletus chrysenteron albocarneus Pk.
Boletus clintonianus Pk.
Boletus edulis Bull.
Boletus edulis clavipes Pk.
Boletus eximius Pk.
Boletus frostii Russell
Boletus granulatus L.
Boletus laricinus Berk.
Boletus luteus L.
Boletus niveus Fr.
Boletus nobilis Pk.
Boletus ornatipes Pk.
Boletus pallidus Frost
Boletus rubropunctus Pk.
Boletus rugosiceps Pk.
Boletus scaber Fr.
Boletus spectabilis Pk.
Boletus subaureus Pk.
Boletus subglabripes Pk.
Boletus subluteus Pk.
Boletus versipellis Fr.
Bovista pila B. & C.
Bovista plumbea Pers.
Cantharellus cibarius Fr.
Cantharellus cinnabarinus Schw.
Cantharellus dichotomus Pk.
Cantharellus floccosus Schw.

Cantharellus infundibuliformis (Scop.) Fr.
Cantharellus lutescens Fr.
Cantharellus minor Pk.
Clavaria botrytes Pers.
Clavaria botrytoides Pk.
Clavaria conjuncta Pk.
Clavaria cristata Pers.
Clavaria flava Schaeff.
Clavaria pistillaris L.
Clitocybe adirondackensis Pk.
Clitocybe amethystina (Bolt.) Pk.
Clitocybe clavipes (Pers.) Fr.
Clitocybe infundibuliformis Schaeff.
Clitocybe laccata Scop.
Clitocybe maculosa Pk.
Clitocybe media Pk.
Clitocybe monadelpha Morg.
Clitocybe multiformis Pk.
Clitocybe nebularis Batsch.
Clitocybe ochropurpurea Berk.
Clitocybe subcyathiformis Pk.
Clitopilus abortivus B. & C.
Clitopilus micropus Pk.
Clitopilus orcella Bull.
Clitopilus prunulus Scop.
Collybia acervata Fr.
Collybia dryophila (Bull.) Fr.
Collybia familia Pk.
Collybia platyphylla Fr.
Collybia radicata (Relh.) Fr.
Collybia velutipes (Curt.) Fr.
Coprinus atramentarius Fr.
Coprinus comatus Fr.
Coprinus micaceus Fr.
Cortinarius albidipes Pk.
Cortinarius cinnamomeus Fr.
Cortinarius collinitus Fr.
Cortinarius corrugatus Pk.
Cortinarius evernius Fr.
Cortinarius violaceus Fr.
Craterellus cantharellus(Schw.) Fr.
Craterellus cornucopioides Pers.
Crepidotus malachius B. & C.
Entoloma grayanum Pk.
Fistulina hepatica Fr.
Gyromitra esculenta Fr.
Helvella crispa Fr.
Hydnum albidum Pk.
Hydnum caput-ursi Fr.
Hydnum coralloides Scop.
Hydnum repandum L.
Hygrophorus cantharellus Schw.
Hygrophorus chlorophanus Fr.
Hygrophorus flavodiscus Frost.
Hygrophorus fuliginosus Frost.
Hygrophorus laricinus Pk.
Hygrophorus laurae Morg.
Hygrophorus miniatus Fr.
Hygrophorus nitidus B. & C.
Hygrophorus pratensis Fr.
Hygrophorus pudorinus Fr.
Hygrophorus puniceus Fr.
Hygrophorus speciosus Pk.
Hygrophorus virgineus (Wulf.) Fr.
Hypholoma aggregatum sericeum Pk.
Hypholoma incertum Pk.
Hypholoma perplexum Pk.
Hypomyces lactifluorum (Schw.) Tul.
Lactarius camphoratus (Bull.) Fr.
Lactarius chelidonium Pk.
Lactarius deceptivus Pk.
Lactarius deliciosus Fr.
Lactarius distans Pk.
Lactarius gerardii Pk.
Lactarius lignyotus Fr.
Lactarius luteolus Pk.
Lactarius rimosellus Pk.
Lactarius serifluus (DC.) Fr.
Lactarius subdulcis (Bull.) Fr.
Lactarius subpurpureus Pk.
Lactarius volemus Fr.
Lepiota americana Pk.
Lepiota cepaestipes Sow.
Lepiota clypeolaria (Bull.) Fr.
Lepiota naucinoides Pk.
Lepiota procera Scop.
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Lycoperdon cyathiforme Bosc.
Lycoperdon gemmatum Batsch.
Lycoperdon giganteum Batsch.
Lycoperdon subincarnatum Pk.
Marasmius oreades Fr.
Mitrula vitellina irregularis Pk.
Morchella angusticeps Pk.
Morchella bispora Sor.
Morchella conica Pers.
Morchella deliciosa Fr.
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Paxillus involutus Fr.
Pholiota adiposa Fr.
Pholiota caperata Pers.
Pholiota discolor Pk.
Pholiota duroides Pk.
Pholiota praecox (Pers.) Fr.
Pholiota squarrosa Muell.
Pholiota squarrosoides Pk.
Pholiota vermiflua Pk.
Phylloporus rhodoxanthus (Schw.) Bres.
Pleurotus ostreatus Fr.
Pleurotus sapidus Kalchb.
Pleurotus ulmarius Bull.
Pluteus cervinus (Schaeff.) Fr.
Polyporus sulphureus Fr.
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Tricholoma personatum Fr.
Tricholoma portentosum centrale Pk.
Tricholoma radicatum Pk.
Tricholoma russula (Schaeff.) Fr.
Tricholoma silvaticum Pk.
Tricholoma sordidum (Schum.) Fr.
Tricholoma subacutum Pk.
Tricholoma subsejunctum Pk.
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